Green Up the Roof!

TECHNICAL MANUAL

Product Name

DIADEM® DiaSafe® – System

Anchoring points as per standards EN795:2012 and CEN/TS 16415:2013

DiaSafe® - Single - System "Solo"
DiaSafe® - Single - System "Duo"
DiaSafe® - Line - System "Multi"
DiaSafe® - Line - System "Glide Solo"
DiaSafe® - Line - System "Glide Duo"

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1 Introduction - General description

DiaSafe® is a range of elements that perfectly combine into a fall protection system designed to ensure the safety of staff working at heights.
They have been tested by TÜV AUSTRIA, Europe's leading safety validation organization. The systems conform to the most recent standard, EN 795:2012, when used with personal protection equipment that meets standards EN 363 and EN 365.
The DiaSafe® Systems may be used both as fall arrest or fall restraint systems.
The systems meet all work safety standards and requirements without affecting the roof in any way. The waterproofing, roof insulation and roof structure remain intact
The DiaSafe® Systems can be installed on green, gritted, or paved roofs, with up to a 5° incline.
The key factor is to ensure a minimum ballast weight of 80 kg/m^2 for the standard 3m×3m size fall arrest mat.

This manual is intended to present four members of the DiaSafe® family:

- **DiaSafe® - Single - System "Solo"** Product No.:130097
- **DiaSafe® - Single - System "Duo"** Product No.:130097
- **DiaSafe® - Line - System "Multi"** Product No.:130098
- **DiaSafe® - Line - System "Glide Solo"** Product No.:130100
- **DiaSafe® - Line - System "Glide Duo"** Product No.:130100

Besides many other, all systems have their own specific advantage and feature.
Single Systems (**"Solo"** and **"Duo"**) –anchoring one or two users- are used when there's no need for linear protection on a roof. The installation of these systems is very quick and simple.
Line Systems provide linear protection along the edge of the roof.
In case of **"Multi"** numerous users may be attached to the system at a time, while one main advantage of "**Glide Solo" and "Glide Duo"** system is that it's designed in such a way that users have the maximum freedom of movement without the need of reattachments.

DiaSafe® System users are obliged to carefully read this manual prior to using the system, and shall closely follow all relevant safety regulations during use.

2 Regulations - Legal background

2.1 Relevant norms and guidelines

All relevant EU standards and directives must be taken into consideration. These standards are in particular:

- EN361:2002 Personal protective equipment against falls from a height. Full body harness
- EN362:1992 Personal protective equipment against falls from a height. Connectors
- EN363:2008 Personal fall protection equipment. Personal fall protection systems
- EN364:1992 Personal protective equipment against falls from a height. Test methods
- EN365:2004 Personal protective equipment against falls from a height. General requirements for instructions for use, maintenance, periodic examination, repair, marking and packaging
- EN795:2012 Protection against falls from height. Anchoring devices
- PPE Directive 89/686/EEC on personal protective equipment (21 December, 1989) – Hungarian equivalent is SzMM decree 18-2008. (XII. 3)
- PrSV/PrSG product safety regulation; official product safety regulations (Switzerland)
- ISO9001:2008 Quality management systems. Requirements
- CEN/TS 16415:2013 Personal fall protection equipment – Recommendations for anchor devices for use by more than one person
- FLL Guidelines for the Planning, Construction and Maintenance of Green Roofing
- D-A-CH-S. expert group recommendations

Warning!

Standards and directives cited above not only apply to the manufacturer of this anchoring system; they apply to the system owner/facility manager and other entities contracted for work to be carried out on roofs where personal protective equipment or fall- protection systems are necessary. Owners and facility managers are not obliged to have a detailed knowledge of standard textual content. Owners and facility managers shall observe local safety and tool-related regulations!

For further information, please refer to Chapters 13 and 14 of this Manual.

2.2 Legislations

- In accordance with actual labor safety and accident prevention regulations, all personnel participating in the construction, maintenance and other works on roofs, must be secured against fall.
- In all countries where DiaSafe® system is installed, all relevant regulations about commercialisation and application shall be respected.
- When selling the system in a third country, the distributor shall notify relevant parties of regulations and legislation in force.
- If a distributor exports the DiaSafe® fall protection system to a third country, the distributor shall have to make sure that the entire Technical Manual of the system is available in the official language(s) of that country.
- A DiaSafe® fall protection system installed by the manufacturer or its authorised representative shall be received by the owner/facility manager as a part of the official handover process.

2.3 Manufacturer's responsibility

- Manufacturer's responsibility covers faulty products, unless the fault occurred as a result of inappropriate use. Manufacturer shall only replace faulty or damaged components. No further claims (indirect or property damage) are acknowledged by the manufacturer
- A major prerequisite of long term fall protection system operation is regular maintenance as prescribed by the manufacturer. Should maintenance steps fail to be executed in due time or they are not executed by an individual authorised by the manufacturer to do so, the manufacturer's responsibility shall terminate after 12 months of official system handover. This is not the case when the owner/operator has entered a proper maintenance contract with the manufacturer.
- Manufacturer's responsibility shall also terminate after 12 months if any periodic system-check fails to be completed or such checks are not conducted by a certified inspector or trained installer trained by the manufacturer.
- System checks should be carried out at least once in every 12 months. Check interval durations depend on relevant regional regulations, system use frequency, as well as local conditions (e.g. chemical hazards).
- DiaSafe® systems can be extended using original accessories developed exclusively by the manufacturer. Should any components or products of any other manufacturer be installed or used in the system, manufacturer's responsibility and guarantee terminate immediately.
- Should the system not be installed or assembled by the manufacturer or a contractor authorised for installation, the manufacturer shall accept no claims, other than for faulty products.
- Should a fall occur, system components designed for energy absorption deform. Manufacturer shall cease to take any further responsibility for these components and related parts and, as such, the system must be discarded – preventing further use.

3 DiaSafe® - System - Product description

3.1 Introduction

All metal DiaSafe® components are made from stainless steel alloy which complies with EN 10020 (high-grade) standard; its material code is: 1.4404 (316)

The damping plate, and the cone fitted onto it, are made from fiberglass-reinforced polyester resin. The connecting ballasting layer (geotextile) is made from polypropylene. This mat carries the ballasting layer which is necessary for static reasons.

Standard damping mat size is 9.00 m², where sides are 3.00 x 3.00 m. Custom size mats can be installed by taking specific weight and related ballasting layer thickness into consideration (see tables in chapters of specification of each systems). Minimum thickness of the ballasting layer shall never be less than 3 cm.

3.2 Components of the DiaSafe® Systems

DS-Single/Glide anchor post
Product No.: 100353

High grade 1.4404 steel console, bent and welded from a circular sectioned steel rod, including an absorption spring.
Rod diameter: 8.0 mm
Base diameter: 250 mm
Height: 300 mm

Custom sizes up to 1400 mm can be ordered from the manufacturer.

DS-Line anchor post
Product No.: 100316

High grade 1.4404 steel console, bent and welded from a circular sectioned steel rod.
Rod diameter: 8.0 mm
Base diameter: 250 mm
Height: 300 mm

Custom sizes up to 1400 mm can be ordered from the manufacturer.

Damping plate
with integrated damping mat
Product No.: 100302

The damping plate is made from fiberglass and steel reinforced laminated polyester resin.

The cone is designed to hold a force equivalent to 70 kg and allow energy absorbing movements at higher loads.

Mat material: polypropylene.
Size: Length × Width = 3.0 x 3.0 m

Height extension damping plate
Product No.: 100304

Designed to hold long anchoring posts in place and ensure equal look to all de post ends. Required whenever custom-built, long anchoring posts are installed in compliance with the layer thickness of roof ballasting material.
Made of fiberglass reinforced polyester resin.

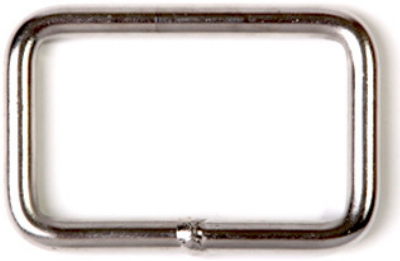
FGM-1.0 Fixing head
Product No.: 100318

A stainless steel bayonet-mount attaches the wire on the top of the anchor post. The attachment is fixed with a setscrew that has to be tightened to at least 4 Nm and no more than 6 Nm.
Material: 1.4404 steel
Size: **Ø28×60** mm (diameter × height)
Setscrew: M10×25 (A2), DIN 912, 5mm Allen.

Clamp ring
Product No.: 100319

This high-grade stainless steel ring prevents the bottom part of the fixing head from opening while the setscrew is being tightened.

Material:	1.4404 steel
Diameter (internal/external):	28.5/31.5 mm
Height:	23.0 mm
Material thickness:	1.5 mm



FGSH-2.0 Square ring
Product No.: 100317

Used to fix wire-ends, connect the wire to the first, the end or the corner posts.
Material: high-grade steel 1.4404
Size: 57.5 x 87.5 mm; ∅ 8 mm
Material thickness: Ø 8 mm

FGKa-1.0 Cable thimble
Product No.: 100279

Used in the connection of the wire to the square ring or the turn buckle. The cable thimble helps to keeps the required wire loop shape.

Material:	1.4404 stainless steel
Size:	58 x 38 mm
Groove width:	∅ 8 mm

FGSR-12-ES Turn buckle
Product No.: 100259

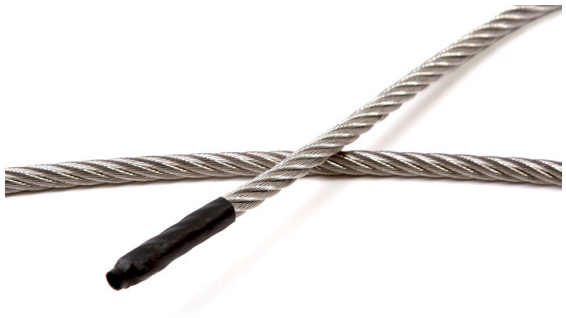
Used during wire installation, at the last Line system post, to achieve the necessary tension or provide additional tension.

Material:	1.4404 stainless steel
Adjustment length:	290 - 415 mm
Thread:	M12

The design of turn buckle positions shall take system and section lengths into consideration – especially change in length due to thermal expansion. Manufacturer's plans shall always be followed!

FGBD-ES-08 Nut clamp
Product No.: 100352

Used to form the wire end terminations of the DiaSafe system. Fixes the fold-back end of the wire to the tensioned part, next to the cable thimble. (screws must be tightened by applying a 7 Nm torque).
Material: Galvanised steel
Wire diameter: Ø 8 mm



FGL-50 Anchoring wire
Product No.: 100268

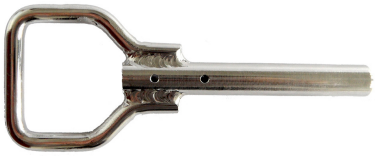
Material: high-grade steel WNr. 1.4404
Diameter: Ø 8 mm (7 x 19 threads)
Tensile strength: F = 33.4 kN

FGT-180 Accessory damping mat
Product No.: 320317

If necessary, this mat can be used to increase the ballasting area.
In such cases, the load per m² can be decreased after discussions with the manufacturer.
As an additional advantage, the mat will also serve as a filtering layer.
Material: polypropylene.

Glider post head
Product No.: 100349

Made to fit over the DS-Single anchoring post and accommodate the FGL-50 anchoring wire in such way, that the DiaGlider will run through it. With this solution it's possible to freely work on the roof without having to reattach the personal protective equipment at the posts.
Casted from 1.4404 stainless steel.



Swaged square end
Product No.: 100354

The fastest way to attach the FGL-50 anchoring wire to the end posts, is to swage this square ring to the wire and simply fix it to the head of the DS-Line anchor post. The fixing is done with the FGM-1.0 fixing head and the clamp ring. Made out of stainless steel 1.4404.

Swaged square end turn buckle
Product No.: 100355

Used during wire installation, at the last Line system post, to achieve the necessary tension or provide additional tension. Fixed as well to the DS-Line anchor post.

Material:	high-grade steel 1.4404
Adjustment length:	290 - 415 mm
Threaded diameter:	∅ 12 mm

Swaged turn buckle
Product No.: 100356

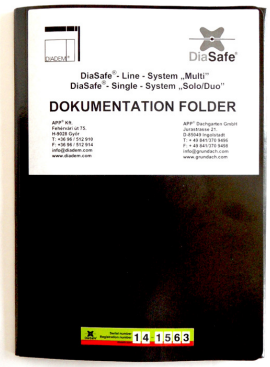
Stainless steel turnbuckle for tensioning the wire rope with swaging rings on end.

Material:	high-grade steel 1.4404
Adjustment length:	325 - 400 mm
Threaded diameter:	∅ 9 mm

DiaGlider with steel karabiner
Product No.: 100350

Easy to attach at any point of the DiaSafe Line system it provides an anchor point that slides freely along all properly installed wires and anchor posts. It gives to a person working on heights a safe anchoring while it provides free movement, without having to constantly reattach.

3.3 Documentation folder



Documentation folders for the four DiaSafe® systems are similar, and they all contain the following items:

- Technical manual
- Control label (self-adhesive sticker)
- Validating sticker (self-adhesive sticker)
- A copy of the certificate
- Handover protocol
- Declaration of Performance (DoP)

Content of the documentation folder – except for the control label and validating sticker – is available for download at www.diasafe.com

The owner must keep system documentation in a secure place, make documentation available to system users, when necessary, and provide proper classroom and field training. The owner or operator of the system may provide the user with a usage plan after consulting with the manufacturer.

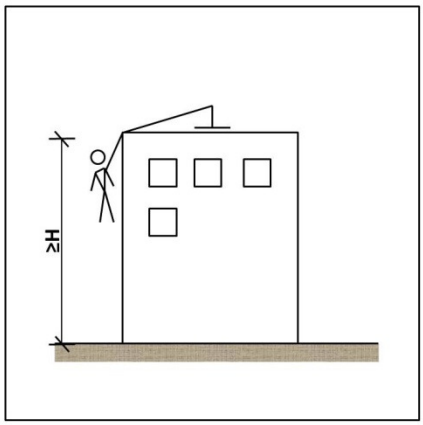
Experts installing the system shall hand over documentation folder to the owner, and ensure that the system has been properly registered.

The sticker shall be affixed to the appropriate location on the control label, onto the side of a laminated cone at one of the anchoring points. The manufacturer shall use his project tracking system to notify the owner of the periodic inspections due.

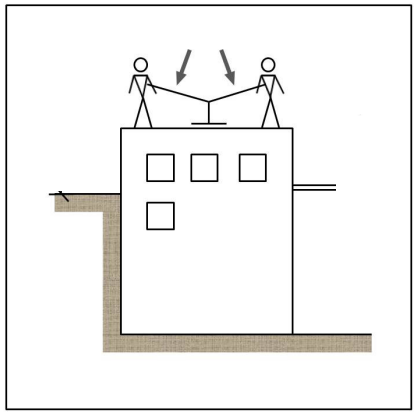
4 DiaSafe® - System - Function

4.1 Fall arrest and restraint system, two in one

DiaSafe® anchoring systems have both **fall- arrest** and **restraint** functions. A system installed at a particular location can be used for a given purpose depending on roof geometry characteristics and the free fall height. System installation is regulated by a commissioning plan approved by the manufacturer.



Fall arrest system



Fall restraint system

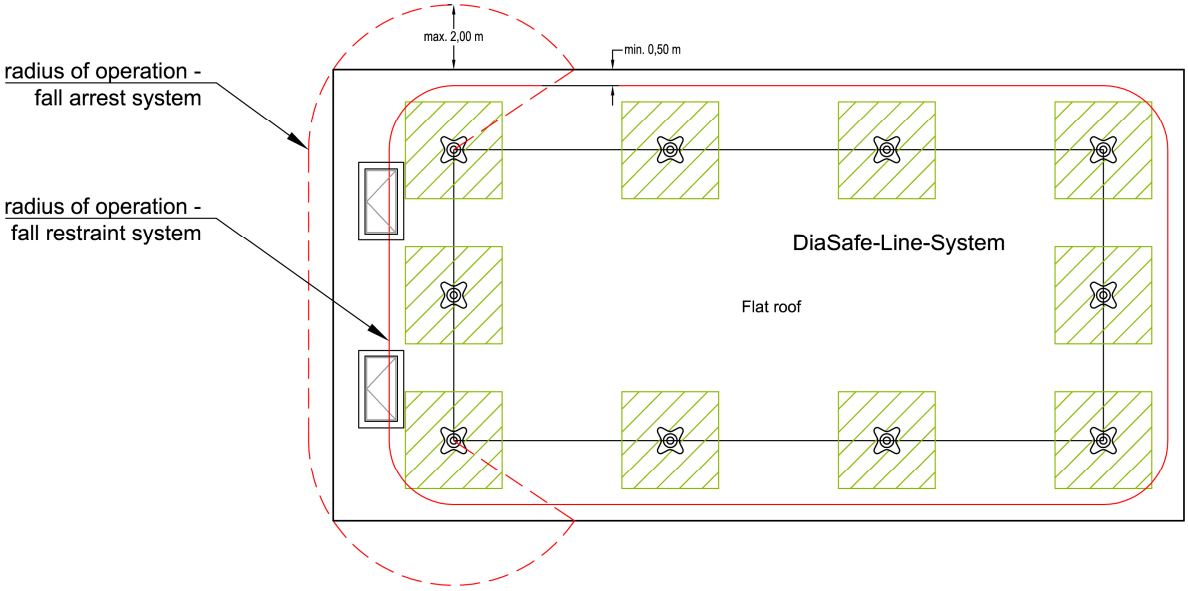
H=minimum building height

a) Fall arrest system:
The user has a personal protective equipment to secure himself. Should a fall occur, the system prevents the user from falling onto the ground or a building part, and it effectively decreases fall length. The system thus prevents the user from free-falling to the ground or hitting a building part.

b) Fall restraint system:
When used as a restraint system, it prevents the user from actually reaching a fall danger-zone because rope lengths are configured in such a way that the user cannot possibly get close to free roof edges.
By taking special building characteristics into consideration, the manufacturer carefully designs systems described herein (restraint systems and fall arrest systems). Restraint systems shall always be favored as they prevent users from getting into dangerous position.

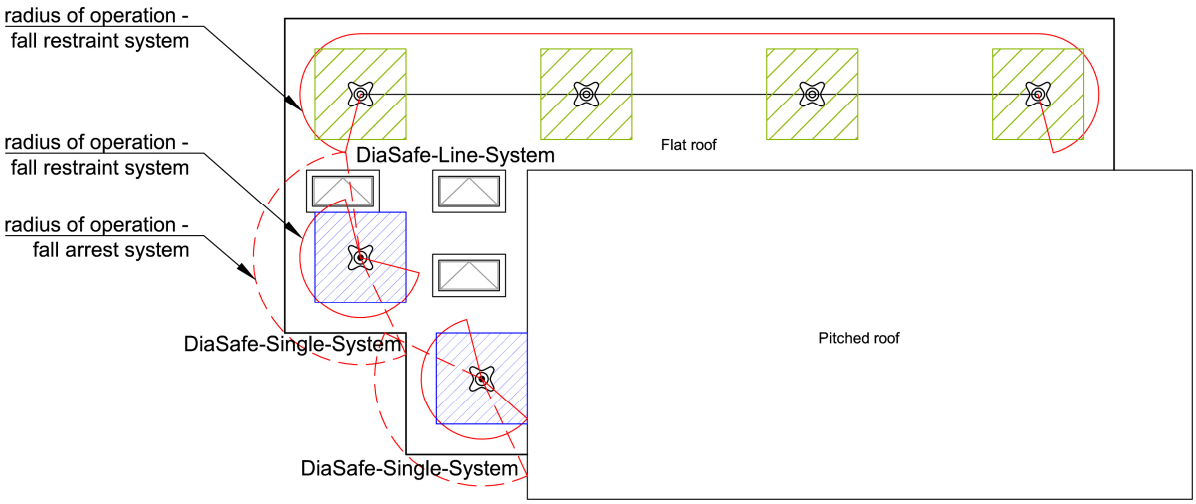
4.2 Combination of fall arrest and restraint systems

The figure below shows roof area allocation based on whether the system operates as a fall arrest or a restraint system.
The radius of operation is given by the length of the rope attached to the personal protective equipment. When used as a restraint system, the length of the rope must be at least 0.5 m shorter than the shortest distance between the system and the edge of the roof. When used as a fall arrest system, the rope may not be more than 2.0 m longer than the distance between the system and the edge of the roof.
The system may operate as a fall arrest system only in such cases when the minimum free fall height is given, otherwise the system may be used only as a restraint system.



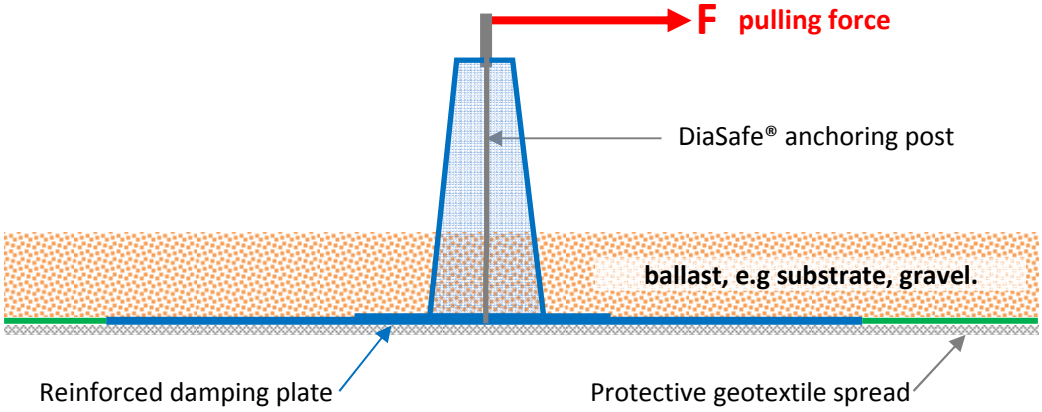
4.3 System type combinations

The figure below shows the combination of two types of restraint and fall arrest systems; Line System and Single System.



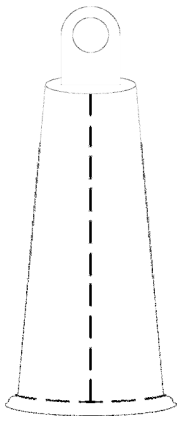
4.4 Functioning principle as fall protection system

The fiberglass and steel reinforced damping plate with the laminated geotextile damping mat is designed to concentrate the ballasting weight on the anchoring posts. The pulling force generated by the fall is transferred to the damping plate and the laminated damping mat which is stabilized and stopped by the frictional force resulting from the load imposed upon it.



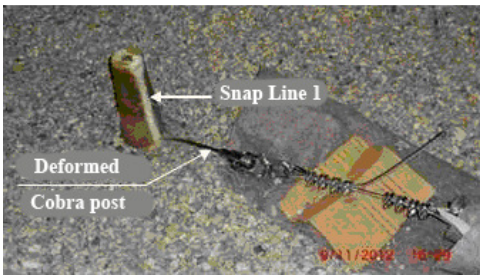
DiaSafe® system structure on the roof
(applies to Line and Single systems alike, not to scale)

DiaSafe® systems provide an active life saving solution when used in combination with proper and system compatible personal protective equipment.

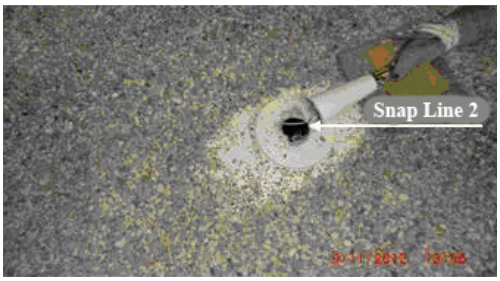


In-built snap lines on a cone

The DiaSafe® anchoring posts absorb primary energy acting on a falling human body by breaking through the stiffening cone and bending down. There are vertical built-in snap lines along the cone and a horizontal one at the base of the cone in order to ensure the appropriate deformation of the post.
The line system absorbs additional energies through the elongation of the wire rope. In order to ensure additional energy absorption during the use of DiaSafe® single system posts, these are provided with an absorption spring, which elongates due to the action of the falling force absorbing additional energies.
Ballast material is an integral part of the system. It is very important to always ensure the necessary ballasting weight, the appropriate thickness in accordance with the material's specific weight. Sliding of ballasting material also absorbs energies that would act on the human body.



Cone split along the built-in vertical snap line.



Anchoring post embedded into the cone stretched as planned, and the cone split along the lower horizontal snap line.

4.5 Maximum deflection and forces permitted

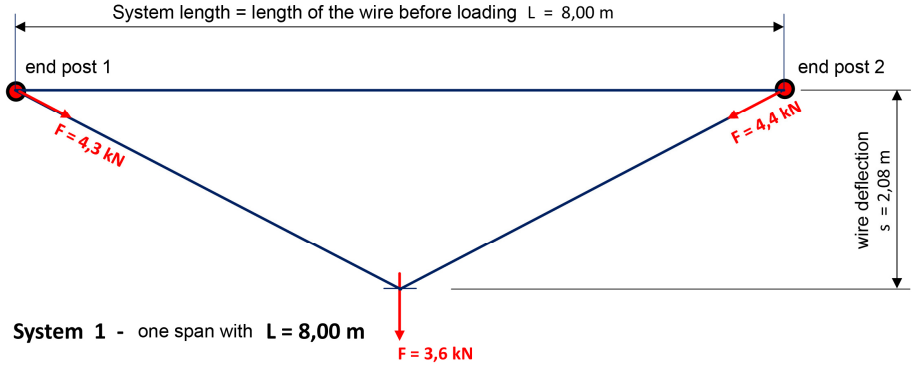
Maximum forces and deflections generated for single posts and system wires - horizontal movement of the anchoring point:

	maximum deflection	max. force at anchoring point	max. force End point 1	max. force End point 2	System structure
	m	kN	kN	kN	
1	2.38	3.6	4.3	4.4	One 8.0 m span pulled at the center
2	0.58	6.0	4.1	4.2	One 1.5 m span pulled at the center
3	0.96	4.7	2.3	6.0	3 spans of 1.5-1.5-8.0 m pulled at the center of the 8.0 m span
4	0.78	5.3	4.6	1.1	3 spans of 1.5-1.5-8.0 m pulled at the center of the end 1.5 m span
5	0.73	6.3			Line System post with 100/300 kg load
6	0.76	5.5			Single System post with 100/300 kg load
7	0.65	9.2			Single System post with 200/600 kg load
8	0.71	4.9			Single System post With max. mat size of 5x8 m, 18 kg/m2 load
9	0.59	5.9			Single System post With mat size of 2x2 m, 180 kg/m2 load
10	0.67	7.9			Single System post 1.4 m height With mat size of 1x1 m, 180 kg/m2 load

In accordance with EN795:2012 and CEN/TS 16415:2013 all components were tested to withstand the prescribed forces as described in below table:

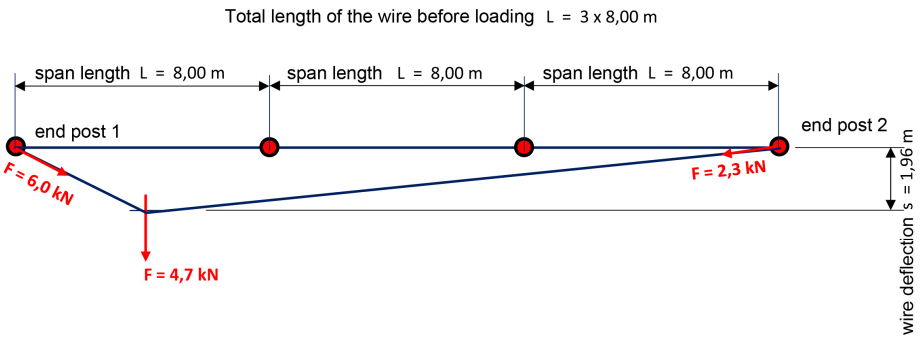
	Norm	Test	Tested components	Test conditions	max. Force
1	EN795:2012	Deformation test	Complete single system Complete line system without wire	80 kg/m2 ballasting 70 kg test mass 2m knotted test rope	0,7 kN
2	EN795:2012	Dynamic strength and integrity test	Complete line system (one user)	80 kg/m2 ballasting 100 kg test mass 2,6 m dropping height 2m knotted test rope	9 kN
				200 kg test mass increase	300 kg
	CEN/TS 16415:2013	Dynamic strength and integrity test	Complete line system (two users)	200 kg/m2 ballasting 200 kg test mass 1,6 m dropping height 1m sewn test rope	12 kN
				400 kg test mass increase	600 kg
3	EN795:2012	Static strength test	Complete single and line system	19 kN hydraulic pulling force	19 kN

Static model for maximum wire forces and deflections, one 8 m span



System 1 - one span with **L = 8,00 m**

Static model for maximum wire forces and deflections, three 8 m spans


Total length of the wire before loading L = 3 x 8,00 m
span length L = 8,00 m
span length L = 8,00 m
span length L = 8,00 m
end post 1
end post 2
F = 6,0 kN
F = 2,3 kN
F = 4,7 kN
wire deflection s = 1,96 m

System 2 - three spans with **3 x L_1 = je 8,00 m,** total length **L = 24,00 m**

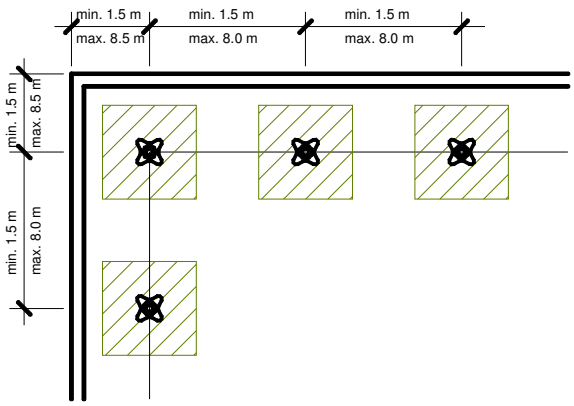
5 DiaSafe® - System - Planning

5.1 Planning principles

The fall protection system shall be designed by the manufacturer, taking into consideration building characteristics and local conditions. The system shall operate as a restraint system or as a fall arrest system. Planning should favor restraint systems in all cases because to ensure that the user cannot even reach the danger zone.
Should building plans change during fall protection system design and commissioning, system manufacturer shall approve the change in due time.

5.2 Vertical and horizontal measures and distances

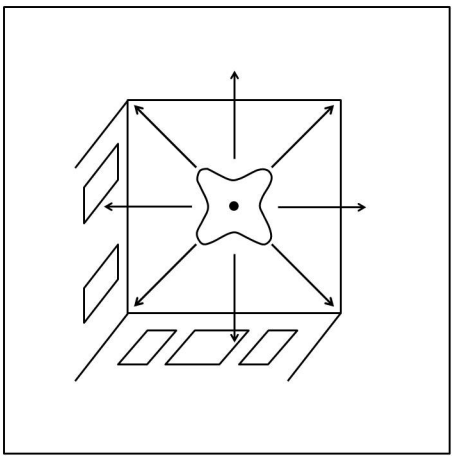
Wire posts can be spaced at a maximum 8.00 meters away from each other. Spans shall have to be negotiated with DiaSafe® system manufacturer in all cases. The manufacturer shall take all static requirements into consideration, and incorporate the necessary figures into the installation plan. Posts should be at least 1.50 meters away from each other, in case of a standard size damping mats.
The max. distance of the posts from the edge of hazard is 8.50 meters.



Warning!
If the Line System is routed around the corner of the building, care must be taken to ensure at least 1.5 meters from roof edge to anchoring point axes in all directions! This rule applies to Single System anchoring points as well. Relevant local regulations must be taken into consideration, as well.
Recommendations of AUVA “Planungsgrundlagen von Anschlageinrichtungen auf Dächern” are to be taken into consideration!

5.3 Potential fall directions

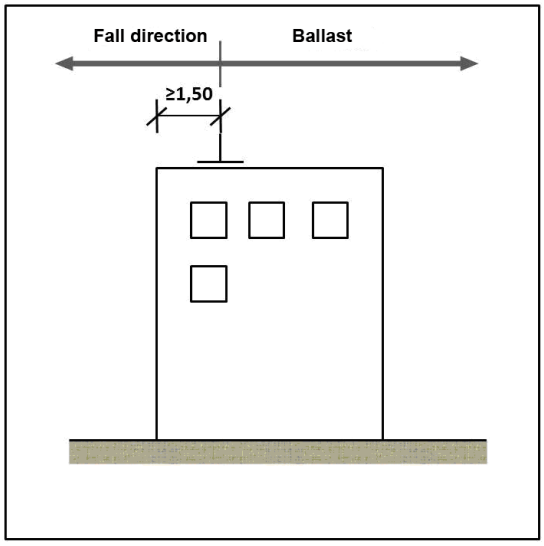
DiaSafe® fall protection systems are designed to protect the user in all fall directions indicated in the manufacturer's plans. This indispensable plan should contain all necessary anchoring points (along roof edges or corners) in a way that takes static and geometric system movements into consideration.



Potential fall directions

Actual location of the fall protection system depends on manufacturer's installation plans. System installation obviously takes location specific characteristics into consideration.

5.4 Distance from edge of hazard



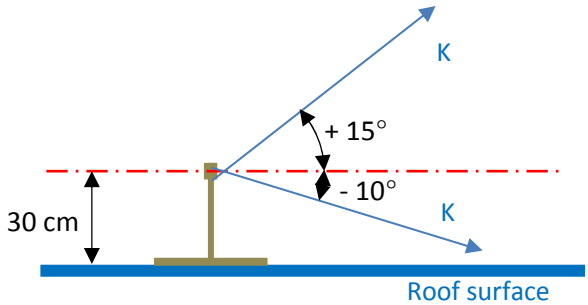
Minimum distance of the system from edge of hazard (considering the recommendations of AUVA: "Planungsgrundlagen von Anschlageinrichtungen auf Dächern") :

Standard (3×3 m) damping mat:

1. width of parapet wall: x cm:
   x cm + 1.5 m
2. without parapet wall: 2.0 m from edge

Reduced (2x2 m) damping mat:

1. width of parapet wall: x cm:
   x cm + 1.0 m
2. without parapet wall: 1.5 m from edge

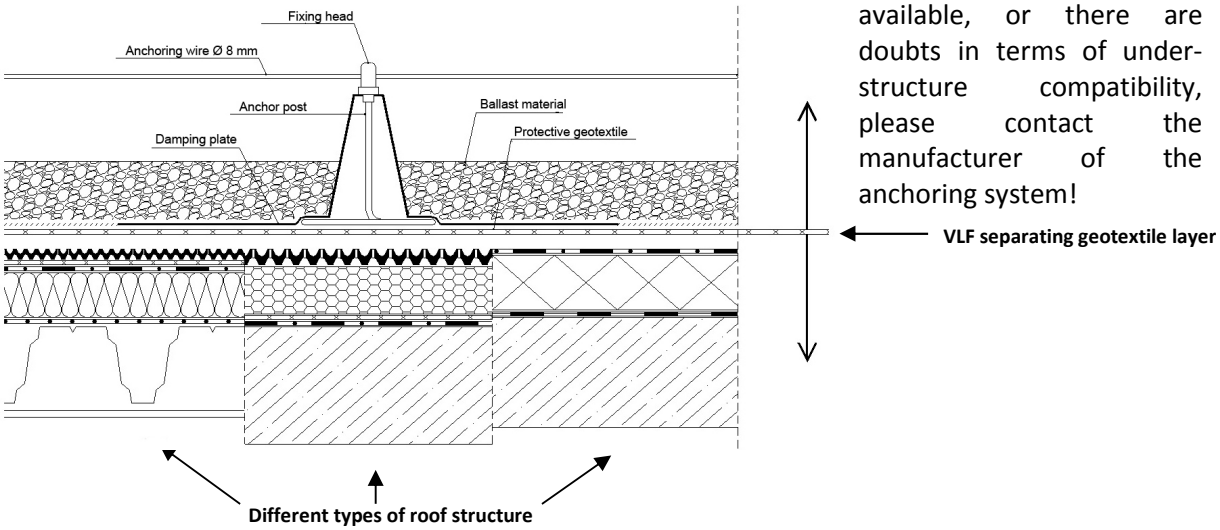


K: Personal protective equipment rope

The figure shows the max. permitted positive and negative angle deflection of the personal protective equipment rope. This helps us determine the distance necessary from the parapet wall or, if the distance from the roof edge is already provided, the permitted parapet height can be determined.

5.5 Building structure and underlay

DiaSafe® systems have been tested and certified on a whole variety of surface types and base structures. Its operation has been checked on the most common insulation materials and roof surfaces. Structural characteristics can help determine which system is the most suitable for a particular roof.



If roof structure is not available, or there are doubts in terms of under-structure compatibility, please contact the manufacturer of the anchoring system!

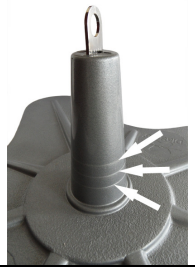
5.6 Ballasting layer

System stability is ensured by the ballasting layer which, in case of green roofs, can be soil or soil like mixture, gravel, cobble stone or other bulk material. Different types of ballasting materials require a statically determined layer thickness. These are defined by the manufacturer on an individual basis, and must be checked on-site (during the handover process).

DiaSafe® anchoring points can be used on roofs with less than 5° slope. It must be ensured that the surface weight of the ballasting layer is at least 80 kg/m² in dry condition for the standard size mat, in case of one user. (See specifications for each system.)

5.7 Ballasting surface

Standard ballasting surface size for DiaSafe® anchoring points is 9.0 m². This size is achieved by the standard damping mat of 3.0 x 3.0 m laminated into the damping plate. This is then covered by a minimum of 80 kg/m² surface load (this applies for the Line System ”Multi” with one user in every other section, the Line System ”Glide Solo” with one user, or the Single System ”Solo” with one user). Should system structure and objective require, this figure may be higher. This means, that the total weight for one post is at least 720 kg.
Ballasting surface size is determined by the required load and type of ballasting material. Ballasting material can be spread on the surface in varying thicknesses. It is crucial to always ensure the minimum ballast layer thickness stipulated in the table above.
Damping mat sizes and related minimum ballasting layer thicknesses of some common ballasting materials are shown in tables in the chapters of specification of each system.(Chapters 7,8,9)

Height markings on the side of the laminated cone will help you control the on-site ballasting layer thickness. Ballasting layer thickness should reach the minimum figures indicated in the documentation. Ballasting material data sheets, including actual weight data, shall always be available for annual checks. As an example, for informational purposes only, the example below shows the specific weight of the ballasting material, related to the marking lines, for a standard mat of 3×3 m and a surface weight of 80kg/m^2: Upper height line: 800 kg/m^3 Centre height line: 1000 kg/m^3 Lower height line: 1350 kg/m^3	

Plans for custom mat sizes are always made by the manufacturer, and an additional ballasting mat shall be installed in such cases, which shall simply be placed on the top of the default mat. A round opening must be cut in the additional mat, at the appropriate position. This opening must be big enough for the anchoring point's cone to go through it.

Warning!

Since ballasting layer thickness is subject to change, due to being walked upon, wind or rain erosion, etc., actual layer thickness should always be inspected prior to each and every use. Layer thickness must always completely cover the damping mat. The green color of the mat will contrast most ballast materials, thus in case of a too thin ballast layer, the mat will be easily visible. Whenever the mat is visible, indicates that the ballast layer thickness is not enough for safe operation.

A non-visible mat is not a guarantee that the ballast layer is enough for safe operation. If layer thickness is insufficient, it must be replenished to achieve the necessary thickness.

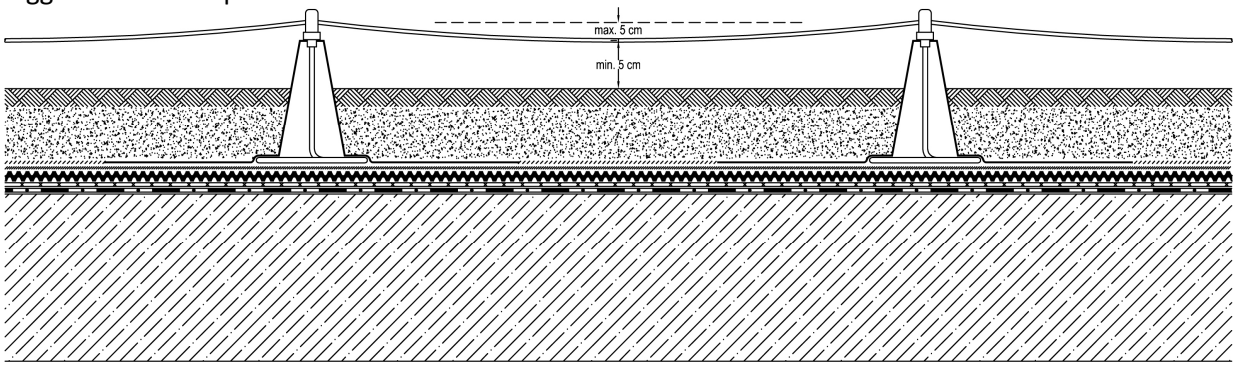
Several types of ballasting materials (growing media, concrete slabs, gravel, etc.) can be combined in a single system; however, such solutions require a specific plan prepared by the manufacturer.

5.8 Thickness of the ballasting layer

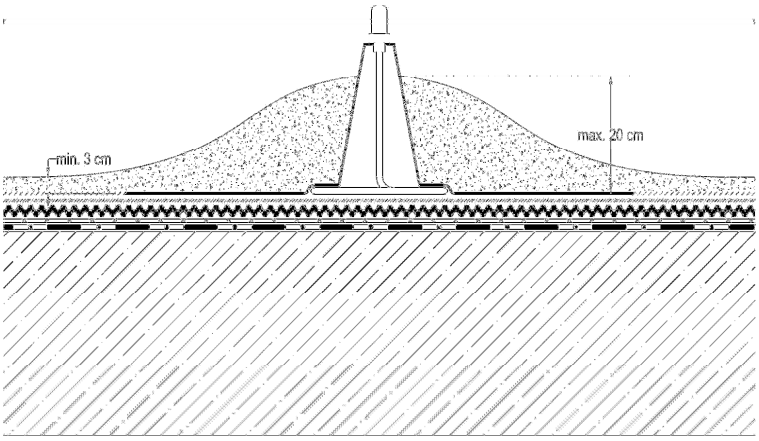
Uniform thickness of the ballasting layer

The ballasting layer is usually designed to be of uniform thickness. It must be ensured that the minimum layer thickness is always achieved (for example: H_{min} = 3 cm for a 40.0 m² damping mat).

In order to ensure proper mobility for the carabiner of the personal protective equipment, the head of the Single System post must be at least 10 cm above the ballasting layer surface. The Line System wire must always remain at least 5.0±2 cm above the surface of the ballasting layer; measured at the biggest deflection point.



Varying thickness of the ballasting layer
It is permissible to form small mounds around system posts. This is usually taken into consideration during planning, and has no effect on minimum layer thickness, which is equally distributed along the entire surface in a depth to ensure 80 kg/m² surface weight.



6 DiaSafe® - System - Installation instructions

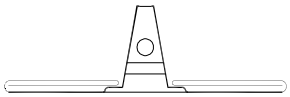
- precondition of starting installation works on a roof is the presence of the following:
  - proper installation plan
  - materials and components of the given system
  - professional installer with certificate
  - adequate tools for installation
- System installation must be carried out by trained staff who has the expertise and responsible approach to install safe systems, preferably trained by the manufacturer. Installation and assembly should follow the manufacturer's plans, or plans approved by the manufacturer, to the letter!
- The installer is not allowed to modify the plans at all, in case of any deviations the installation works may only be continued after the approval of the manufacturer.
- Systems are to be bond to the lightning protection system according to the national standards in force.

7 DiaSafe® Single System ”Solo” / ”Duo” - specification

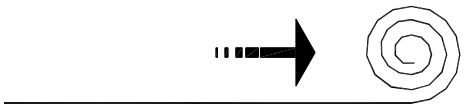
7.1 Tools needed for the installation

cutter
8 m tape measure
shovel

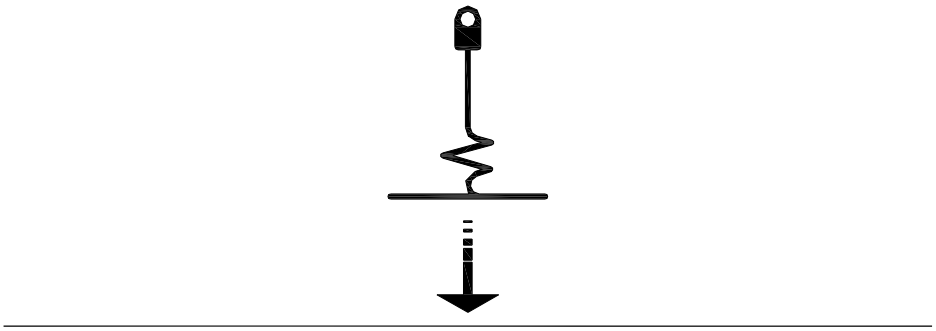
7.2 System components

Name	Photo	Pictogram
DS-Single/Glide anchor post		
Damping plate with integrated damping mat		

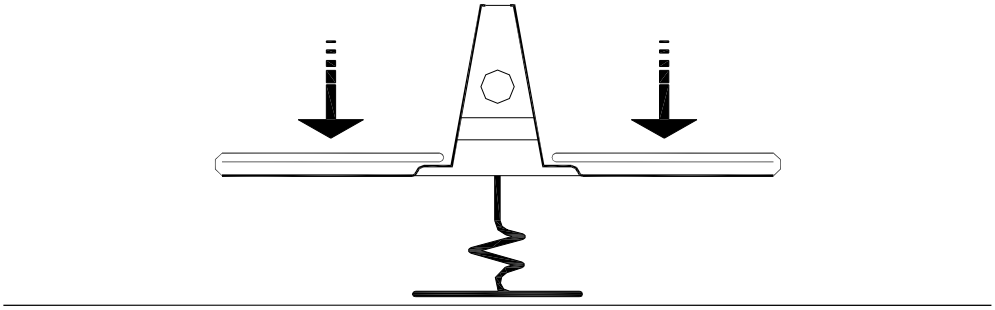
7.3 Steps of installation



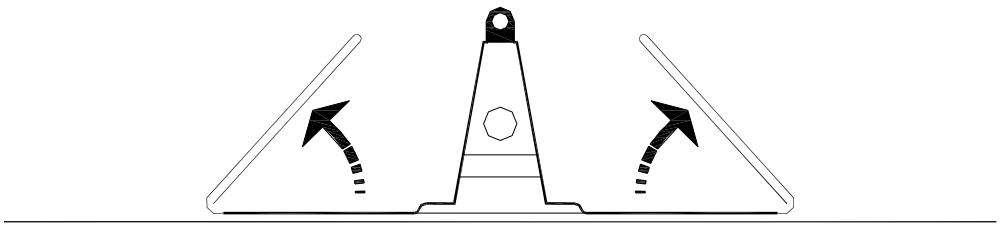
Step 1
Lay a protective geotextile under the DiaSafe® system, onto the upper roof surface which is generally some waterproof insulation; bitumen, PVC, laminated rubber, etc. or a technical layer which constitutes a part of the roof structure.



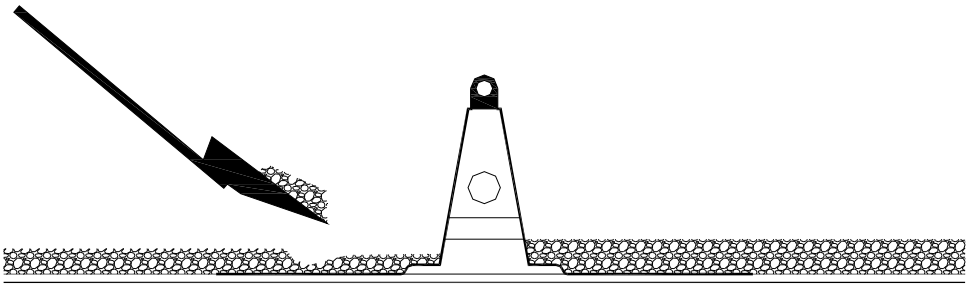
Step 2
On the protective geotextile, position the Single System post at the exact location detailed in the plan.



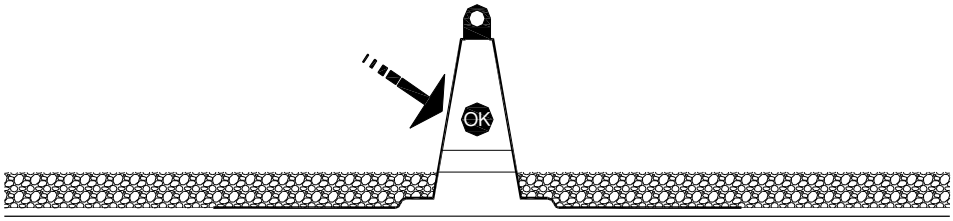
Step 3
Place the Damping plate with integrated damping mat onto the posts.
The base of the high-grade steel post should be fitted to the center of the damping plate, into the projecting section at the bottom of the cone.



Step 4
Unfold the damping mat to its entire area. Smooth the mat (starting from the center, with radial movements toward the corners).
If the plans indicate the use of an Accessory damping mat, cut a 10-12 cm round hole in the center, place it over the damping plate and smooth.



Step 5
Spread the ballasting material in a way to keep the damping mat smooth. You must ensure that the ballasting layer thickness is as required, with special attention to the required ballasting of Duo systems.
(see Chapter 7.4)



Step 6
Finally the professional installer completes and attaches the control label as well as the circular validation sticker onto the cone.

7.4 Ballasting surface

DiaSafe® Single System ”Solo”

Mat size	**Total weight**	**Surface weight**	**Layer thickness: gravel, sand** γ = 1600 kg / m³	**Layer thickness: soil** γ = 1000 kg / m³	**Layer thickness: soil** γ = 800 kg / m³
m² (m × m)	**kg**	**kg / m²**	**cm**	**cm**	**cm**
4.0 (2 × 2)	720	180	10.5	18.0	22.5
6.0 (3 × 2)	720	120	7.0	12.0	15.0
9.0 (3 × 3)	**720**	**80**	**5.0**	**8.0**	**10.0**
12.0 (3 × 4)	720	60	min. 3.5	6.0	7.5
16.0 (4 × 4)	720	45	min. 3.0	4.5	6.0
20.0 (4 × 5)	800	40	min. 3.0	4.0	5.0
25.0 (5 × 5)	875	35	min. 3.0	3.5	4.0
30.0 (5 × 6)	900	30	min. 3.0	3.0	3.5
35.0 (5 × 7)	1050	30	min. 3.0	3.0	3.5
40.0 (5 × 8)	1200	30	min. 3.0	3.0	3.5

DiaSafe® Single System ”Duo”

Mat size	**Total weight**	**Surface weight**	**Layer thickness: gravel, sand** γ = 1600 kg / m³	**Layer thickness: soil** γ = 1000 kg / m³	**Layer thickness: soil** γ = 800 kg / m³
m² (m × m)	**kg**	**kg / m²**	**cm**	**cm**	**cm**
4.0 (2 × 2)	1800	450	28.5	45.0	56.5
6.0 (3 × 2)	1800	300	19.0	30.0	37.5
9.0 (3 × 3)	**1800**	**200**	**12.5**	**20.0**	**25.0**
12.0 (3 × 4)	1860	155	9.5	15.5	19.0
16.0 (4 × 4)	1920	120	7.5	12	15.0
20.0 (4 × 5)	1900	95	6.0	9.5	12.0
25.0 (5 × 5)	2000	80	min. 5.0	7.5	9.0
30.0 (5 × 6)	2400	80	min. 5.0	6.0	7.5
35.0 (5 × 7)	2800	80	min. 5.0	5.5	6.5
40.0 (5 × 8)	3200	80	min. 5.0	min. 5.0	6.0

SOLO

DiaSafe® Single System ”Solo” can be used by only one person at a time.
The min. ballasting weight to be applied onto the damping mat (in case of a standard 3 x 3 m size mat) is: **80 kg/m^2 (720 kg in total)**

DUO

DiaSafe® Single System ”Duo” can be used by two persons simultaneously.
The min. ballasting weight to be applied onto the damping mat (in case of a standard 3 x 3 m size mat) is: **200 kg/m^2 (1800 kg in total)**

Warning!

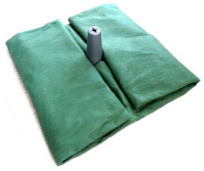
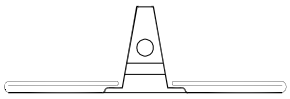
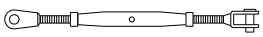
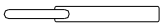
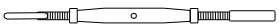
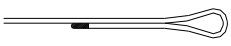
Installation of DiaSafe®-Single ”Solo” System and DiaSafe®-Single ”Duo” System anchoring points are practically identical, the only difference is the weight of the ballasting layer. The damping mat can be smaller than the standard size if the ballasting layer becomes proportionally thicker – but such modification requires the manufacturer's approval.

8 DiaSafe® Line System ”Multi” - specification

8.1 Tools needed for the installation

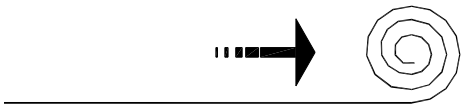
cutter
17 mm wrench
8 m tape measure
cable thimble expanding plier
torque wrench
5mm torque wrench bit
wire cutter
lighter
5 mm allen key
swaging tool
shovel
pincers

8.2 System components

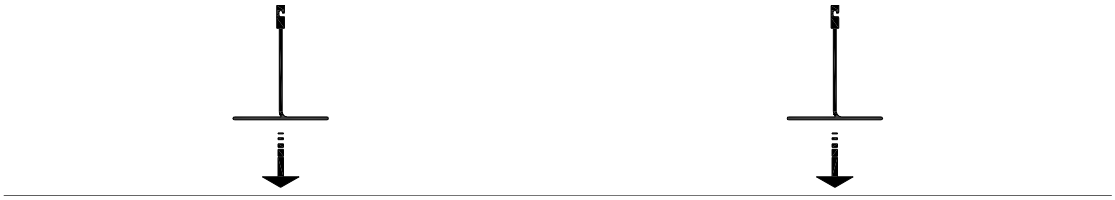
Name	Photo	Pictogram
DS-Line anchor post (type “a” and “b”)		
Damping plate with integrated damping mat (type “a” and “b”)		
Clamp ring (type “a” and “b”)		
FGM-1.0 Fixing head (type “a” and “b”)		
FGSH-2.0 Square ring (type “a”)		
FGKa-1.0 Cable thimble (type “a”)		
FGBD-ES-08 Nut clamp (type “a”)		
FGSR-12-ES Turn buckle (type “a”)		
Swaged square end (type “b”)		
Swaged square end turn buckle (type “b”)		
FGL-50 Anchoring wire (type “a” and “b”)		

8.3 Steps of installation

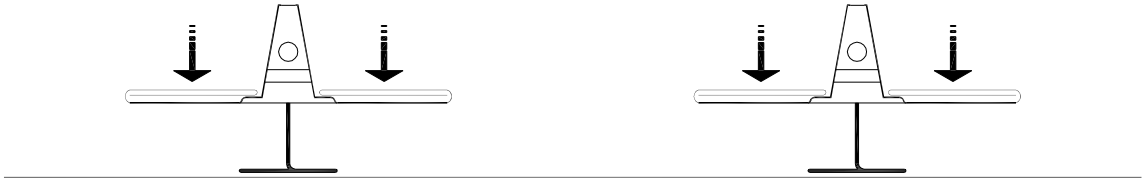
Line System “Multi” can be mounted two ways (“a” and “b”).
The steps of installation of the different types of mounting are separated herein the following installation guide.



Step 1
Lay a protective geotextile under the DiaSafe® system, onto the upper roof surface which is generally some waterproof insulation; bitumen, PVC, laminated rubber, etc. or a technical layer which constitutes a part of the roof structure.

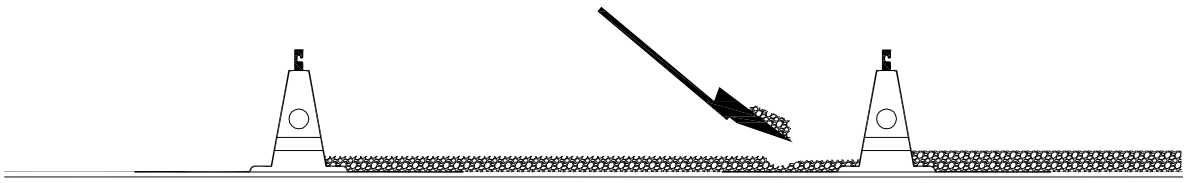


Step 2
On the protective geotextile, position the Line System posts at the exact location detailed in the plan.

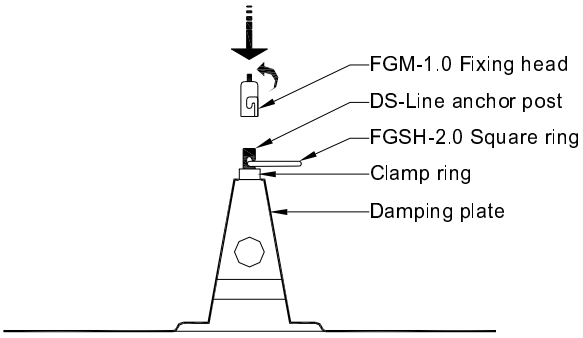


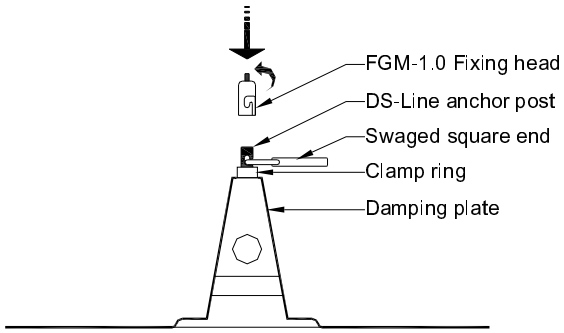
Step 3
Place the Damping plate with integrated damping mat onto the posts.
The base of the high-grade steel post should be fitted to the center of the damping plate, into the projecting section at the bottom of the cone.

Step 4
Unfold the damping mat to its entire area. Smooth the mat (starting from the center, with radial movements toward the corners).
If the plans indicate the use of an accessory damping mat, cut a 10-12 cm round hole in the center, place it over the damping plate and smooth.



Step 5
Spread the ballasting material in a way to keep the damping mat smooth. You must ensure that the ballasting layer thickness is as required.
(see Chapter 8.4)

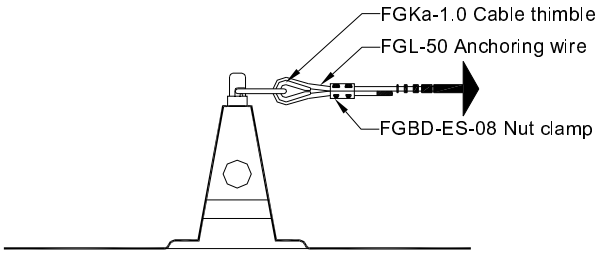




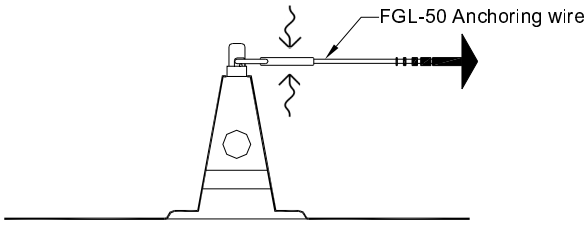
Type „a” Type „b”

Step 6 – type “a”
Place the **Clamp ring** over the **anchor post** head, then place the **Square anchoring ring** into the post head slot. Mount the **FGM-1.0 Fixing head**: Unscrew the setscrew on the fixing head until its almost out, place it onto the post head in such a way that the square ring aligns into the slot. Turn the head clockwise, and lift it up. Tighten the setscrew to 5-6Nm.

Step 6 – type “b”
Place the **Clamp ring** over the **anchor post** head, then place the **Swaged square end** into the post head slot. Mount the **FGM-1.0 Fixing head**: Unscrew the setscrew on the fixing head until its almost out, place it onto the post head in such a way that the square ring aligns into the slot. Turn the head clockwise, and lift it up. Tighten the setscrew to 5-6Nm.



Type „a”



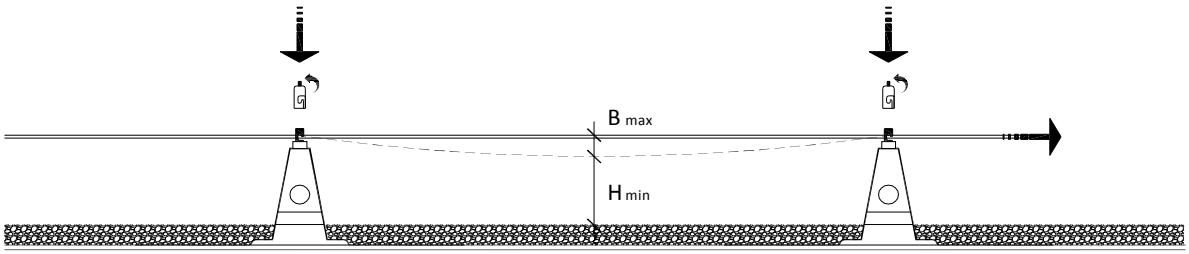
Type „b”

Step 7 – type “a”

Drive the **Anchoring wire** end through the square ring and a **Cable thimble**, and then fold the end back with at least 150 mm (t) overreach. Threads at the clipped end of the wire must be protected by a shrink tube. Fix the wire end with the **Nut clamp**. It is very important, that the Nut clamp must keep parallel while tightening the screws. Screws must be tightened turn by turn, alternating them. If one screw is over tightened compared to the other one, it will bend and break.
Clamp screws should be tightened to 7 Nm.

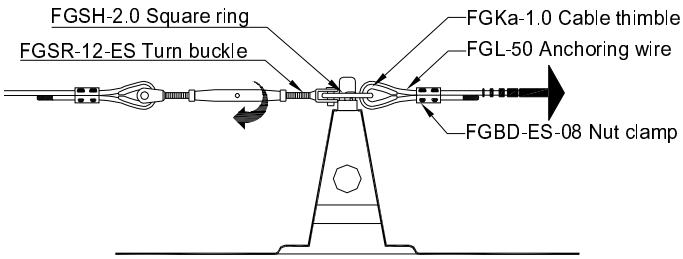
Step 7 – type “b”

Push the end of the **Anchoring wire** into the tube of the Swaged square end. The wire rope end must remain within the tube, but as close as possible to the end. Swage the tube in 4 positions at equal distances from each other. Set the last swaging at a distance of 8-12 mm from the end of the tube.

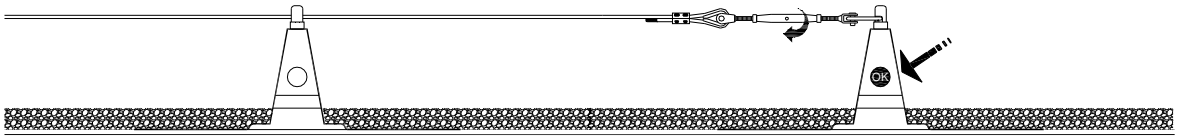


Step 8

Drive the wire through the following post, tighten it and fix it with FGM-1.0 Fixing head as described in Step 6. This operation can easily be carried out by two individuals; one of them tightens the wire, while the other places the fixing heads onto the posts. These steps should be repeated until you reach a corner post or the end post.
When tensioning the wire you should ensure that lagging (B_{max}) shall not exceed 5.0±2 cm. To measure the lagging, you may measure the height of the wire rope at the post, and the height of the wire rope at the middle of the span must be 5±2 cm below this measure. In addition, you should also make sure that the distance (H_{min}) between the ballasting material and the wire is at least 5.0±2 cm. In case the wire rope gets too close to the ballasting material, it may happen that the carabiner/glider will not run smoothly through the wire rope. Elongation of the wire rope due to heat expansion (given by the seasons) and the eventual stretching of the rope throughout the years are considered in above tolerances; however, in case of having an unexpectedly too big elongation in a span, it is necessary to install a turn buckle to ensure necessary tension.



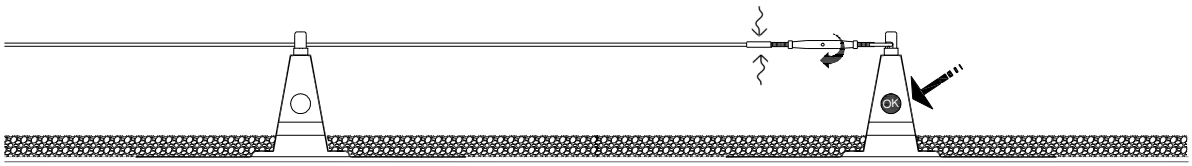
Warning: An excessive lagging will result in a longer deflection of the system in case of a fall. Turnbuckles are not essential to the system but help to maintain the tightness of the spans. The wire rope can be tensioned by hand throughout the installation when the length allows to hold the wire; In the very last span, at the end of the wire rope, it is recommended to install a turnbuckle to provide enough tightness to the last span. In the event of having a span considered to be tightened, it is always possible to install a turnbuckle. It is not recommended to install more than one turnbuckle per span.



Type „a”

Step 9 – type “a”

At the end post repeat the process explained in Step 6. Build in the FGSR-12-ES Turn-buckle into the wire line, between the Square ring and Cable thimble. The turn buckle will make possible to tension the wire in the last section, and will provide additional adjustment during the annual inspection.



Type „b”

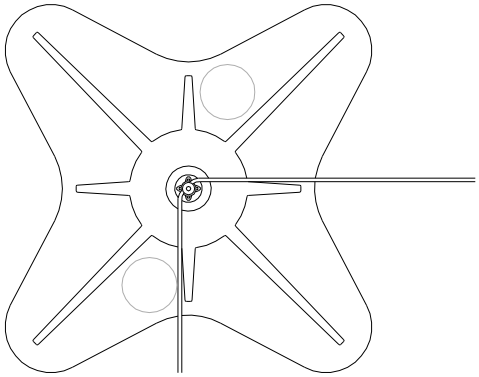
Step 9 – type”b”

Place the Clamp ring over the anchor post head, then place the Swaged square end turn buckle into the post head slot. Mount the FGM-1.0 Fixing head as described in Step 6. Push the end of the anchoring wire into the tube of the Swaged square end turned buckle and swage the tube as described in Step 7.The turn buckle will make possible to tension the wire in the last section, and will provide additional adjustment during the annual inspection.

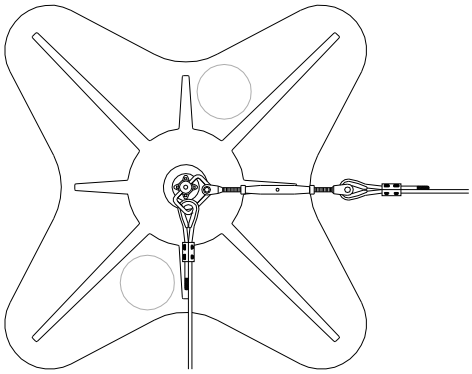
Step 10

Finally the certified installer completes and attaches the control label as well as the circular validation sticker onto one cone of the line system.

Forming corners



Similar to the intermediate posts, the wire rope is simply lead through the head of the corner post and fixed by the fixing head. This solution may not be applied in any cases.
Manufacturer's plans should always be taken into consideration!



A square ring can be installed at the corner to attach the wire. In a closed formation system this is the only solution, as the starting post also serves as the end post.
The square ring installed at the corner provides an option for wire extension as well.

8.4 Ballasting surface

DiaSafe® Line System "Multi"

Mat size	**Total weight**	**Surface weight**	**Layer thickness: gravel, sand** γ = 1600 kg / m³	**Layer thickness: soil** γ = 1000 kg / m³	**Layer thickness: soil** γ = 800 kg / m³
m² (m × m)	**kg**	**kg / m²**	**cm**	**cm**	**cm**
4.0 (2 × 2)	720	180	10.5	18.0	22.5
6.0 (3 × 2)	720	120	7.0	12.0	15.0
9.0 (3 × 3)	**720**	**80**	**5.0**	**8.0**	**10.0**
12.0 (3 × 4)	720	60	min. 3.5	6.0	7.5
16.0 (4 × 4)	720	45	min. 3.0	4.5	6.0
20.0 (4 × 5)	800	40	min. 3.0	4.0	5.0
25.0 (5 × 5)	875	35	min. 3.0	3.5	4.0
30.0 (5 × 6)	900	30	min. 3.0	3.0	3.5
35.0 (5 × 7)	1050	30	min. 3.0	3.0	3.5
40.0 (5 × 8)	1200	30	min. 3.0	3.0	3.5

MULTI

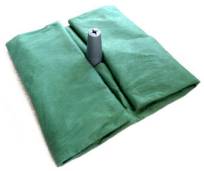
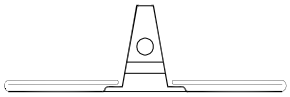
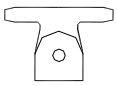
DiaSafe® Line System "Multi" can be used by several users at a time. Maximum 1 user can be attached to one section leaving at least one section free between two users.
The min. ballasting weight to be applied onto the damping mat (in case of a standard 3 x 3 m size mat) is: **80 kg/m² (720 kg in total)**

9 DiaSafe® Line System ”Glide Solo/Duo” - specification

9.1 Tools needed for the installation

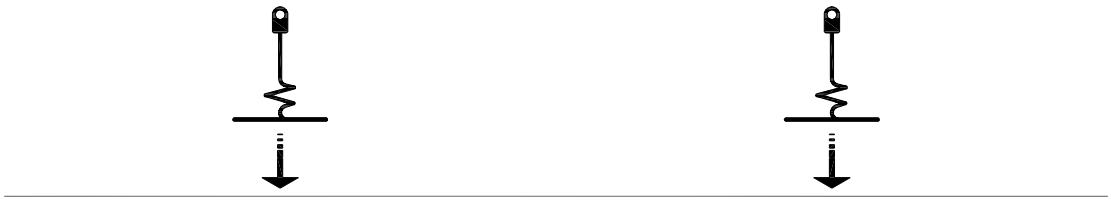
cutter
13 mm wrench
19 mm wrench
8 m tape measure
torque wrench
19 mm torque wrench bit
wire cutter
swaging tool
shovel

9.2 System components

Name	Photo	Pictogram
DS-Single/Glide anchor post		
Damping plate with integrated damping mat		
Glider post head		
Swaged square end		
Swaged turn buckle		
FGL-50 Anchoring wire		
DiaGlider		

9.3 Steps of installation

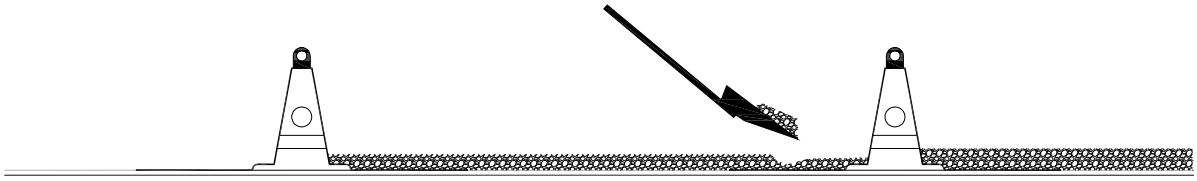
Step 1
Lay a protective geotextile under the DiaSafe® system, onto the upper roof surface which is generally some waterproof insulation; bitumen, PVC, laminated rubber, etc. or a technical layer which constitutes a part of the roof structure.



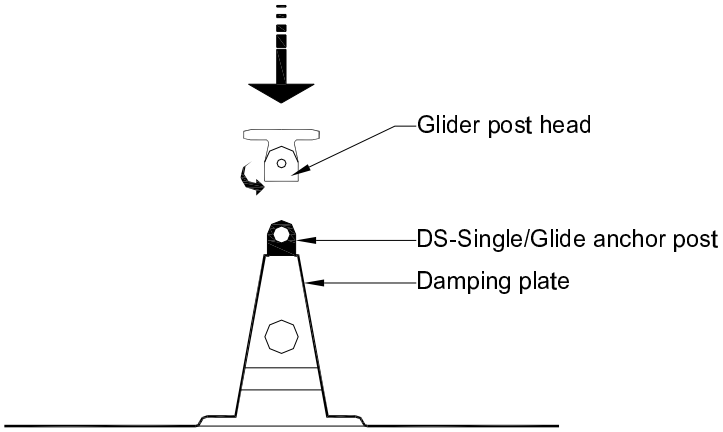
Step 2
On the protective geotextile, position the System posts at the exact location detailed in the plan.

Step 3
Place the Damping plate with integrated damping mat onto the posts.
The base of the high-grade steel post should be fitted to the center of the damping plate, into the projecting section at the bottom of the cone.

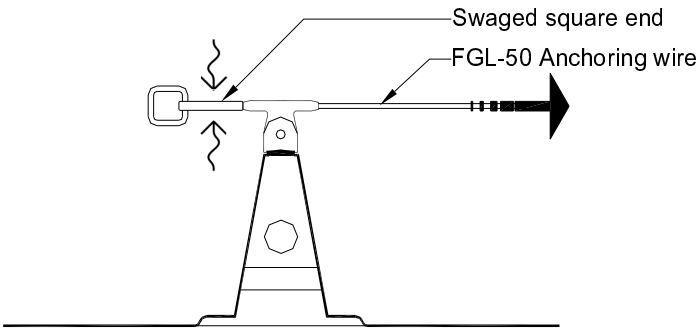
Step 4
Unfold the damping mat to its entire area. Smooth the mat (starting from the center, with radial movements toward the corners).
If the plans indicate the use of an accessory damping mat, cut a 10-12 cm round hole in the center, place it over the damping plate and smooth.



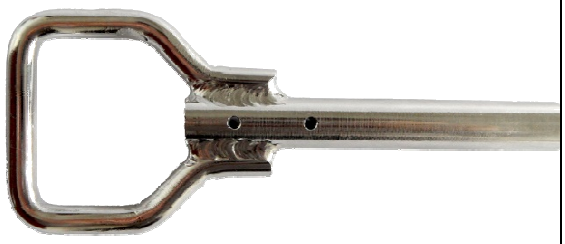
Step 5
Spread the ballasting material in a way to keep the damping mat smooth. You must ensure that the ballasting layer thickness is as required.
(see Chapter 9.4)

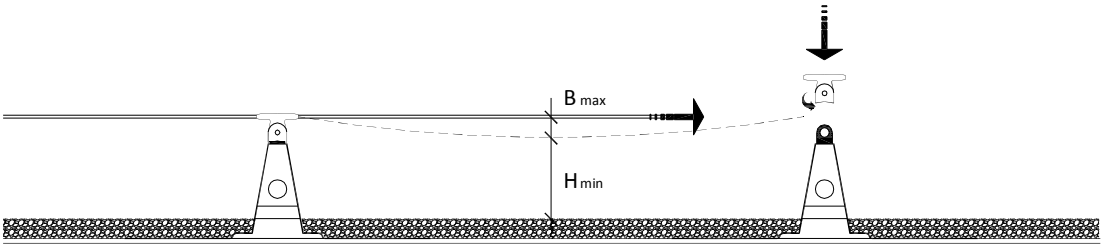


Step 6
Place the Glider post head over the end post head and fix it to it by the set screw. Tighten the setscrew to 5-6Nm.



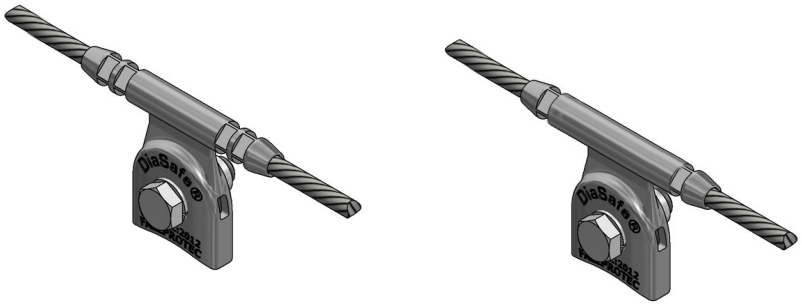
Step 7
Push the end of the wire rope through the tube of the Glider post head. The wire rope end must extend beyond the tube with 10 cm at least. Pull the Swaged square end over the end of the wire rope and swage the tube in 4 positions along the tube at equal distances from each other. Set the last swaging at a distance of 8-12 mm from the end of the tube.

Safety note: For all swaging in the system: 1.- Make sure the wire rope is fully inserted into the swaging tube. The wire rope must be well visible at both perforations of the tube to be swaged. 2.- Make sure the preset swaging force is delivered by the swaging machine. The swaging machine must click when the preset force is reached. If the battery is low in charge, the failure indication light turns on, or there is any other doubt, the swaging must be considered as inadequate and must be discarded.	

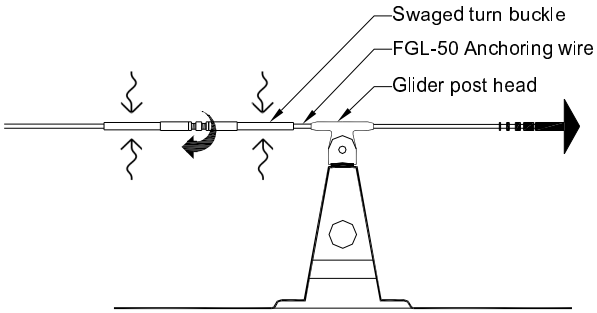


Step 8

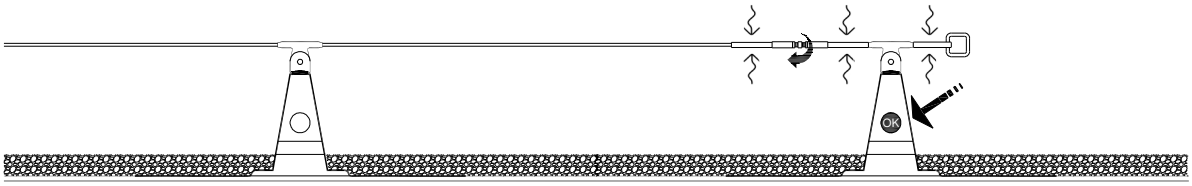
Place the Glider post heads over the intermediate post heads and fix them, then drive the wire through the tube of the Glider post heads. Swage the tube in 4 positions according to the figure below. Set the last swaging at a distance of 8-12 mm from the ends of the tube.
Glider post heads on the intermediate posts of a system may be swaged only in 2 positions (one on each side of the tube).



When tensioning the wire you should ensure that lagging (B_{max}) shall not exceed 5.0±2 cm. To measure the lagging, you may measure the height of the wire rope at the post, and the height of the wire rope at the middle of the span must be 5±2 cm below this measure. In addition, you should also make sure that the distance (H_{min}) between the ballasting material and the wire is at least 5.0±2 cm. In case the wire rope gets too close to the ballasting material, it may happen that the carabiner/glider will not run smoothly through the wire rope. Elongation of the wire rope due to heat expansion (given by the seasons) and the eventual stretching of the rope throughout the years are considered in above tolerances; however, in case of having an unexpectedly too big elongation in a span, it is necessary to install a turn buckle to ensure necessary tension.



Warning: An excessive lagging will result in a longer deflection of the system in case of a fall. Turnbuckles are not essential to the system but help to maintain the tightness of the spans. The wire rope can be tensioned by hand throughout the installation when the length allows to hold the wire; In the very last span, at the end of the wire rope, it is recommended to install a turnbuckle to provide enough tightness to the last span. In the event of having a span considered to be tightened, it is always possible to install a turnbuckle. It is not recommended to install more than one turnbuckle per span.



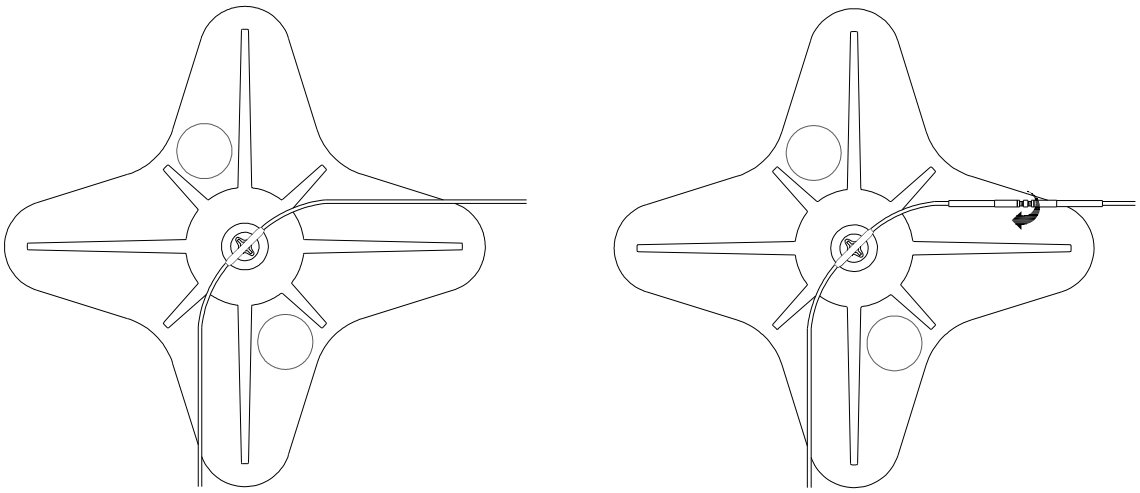
Step 9

At the end post repeat the process explained in Step 6. and Step 7 except that here the Swaged turn buckle has to be inserted in front of the Glider post head. Swage the tubes of the Swaged turn buckle on both sides as described in Step 8.The turn buckle will make possible to tension the wire in the last section, and will provide additional adjustment during the annual inspection.

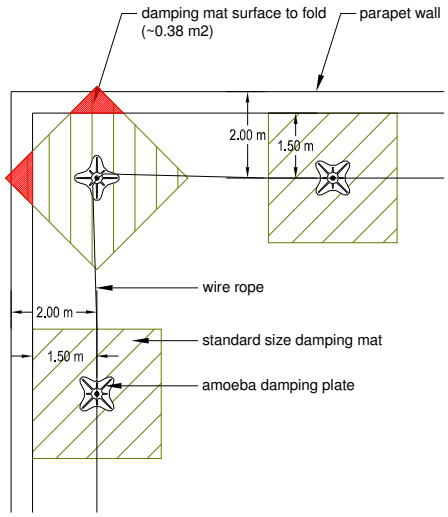
Step 10

Finally the certified installer completes and attaches the control label as well as the circular validation sticker onto one cone of the line system.

Forming the corners



The type of the corner anchoring posts is the same as that of the intermediate posts. Lead the wire rope through the glider post head, and form the angle of the corner needed by the wire rope. This corner formation will provide free traversability for the glider. In case of wire rope extension a turn buckle should be built in the line.



The corner post of the Glide system - thus the damping plate and **standard size mat** belonging to it - has to be installed rotated compared to the rest of the posts, that is running with the bisector of the corner angle (ex.: rotated by 45° in case of a right angled corner). This implies that a certain surface area of the damping mat – depending on the distance of the system from the edge - has to be folded (max. 0.76 m^2). In spite of the reduced sized damping mat at the corner, the system provides a safe use of the system

9.4 Ballasting surface

DiaSafe® Line System ”Glide Solo” - one user

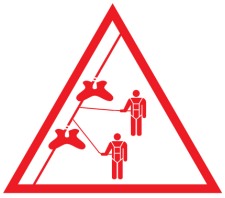
Mat size	**Total weight**	**Surface weight**	**Layer thickness: gravel, sand** γ = 1600 kg / m^3	**Layer thickness: soil** γ = 1000 kg / m^3	**Layer thickness: soil** γ = 800 kg / m^3
m^2 (m × m)	**kg**	**kg / m^2**	**cm**	**cm**	**cm**
4.0 (2 × 2)	720	180	10.5	18.0	22.5
6.0 (3 × 2)	720	120	7.0	12.0	15.0
9.0 (3 × 3)	**720**	**80**	**5.0**	**8.0**	**10.0**
12.0 (3 × 4)	720	60	min. 3.5	6.0	7.5
16.0 (4 × 4)	720	45	min. 3.0	4.5	6.0
20.0 (4 × 5)	800	40	min. 3.0	4.0	5.0
25.0 (5 × 5)	875	35	min. 3.0	3.5	4.0
30.0 (5 × 6)	900	30	min. 3.0	3.0	3.5
35.0 (5 × 7)	1050	30	min. 3.0	3.0	3.5
40.0 (5 × 8)	1200	30	min. 3.0	3.0	3.5

DiaSafe® Line System ”Glide Duo” - two users

Mat size	**Total weight**	**Surface weight**	**Layer thickness: gravel, sand** γ = 1600 kg / m³	**Layer thickness: soil** γ = 1000 kg / m³	**Layer thickness: soil** γ = 800 kg / m³
m² (m × m)	**kg**	**kg / m²**	**cm**	**cm**	**cm**
4.0 (2 × 2)	1800	450	28.5	45.0	56.5
6.0 (3 × 2)	1800	300	19.0	30.0	37.5
9.0 (3 × 3)	**1800**	**200**	**12.5**	**20.0**	**25.0**
12.0 (3 × 4)	1860	155	9.5	15.5	19.0
16.0 (4 × 4)	1920	120	7.5	12	15.0
20.0 (4 × 5)	1900	95	6.0	9.5	12.0
25.0 (5 × 5)	2000	80	min. 5.0	7.5	9.0
30.0 (5 × 6)	2400	80	min. 5.0	6.0	7.5
35.0 (5 × 7)	2800	80	min. 5.0	5.5	6.5
40.0 (5 × 8)	3200	80	min. 5.0	min. 5.0	6.0

GLIDE Solo

Anchoring max. **1 user** simultaneously, the min. ballasting weight to be applied onto the damping mat (in case of a standard 3 x 3 m size mat) is: **80 kg/m² (720 kg in total)**



GLIDE Duo

Anchoring max. **2 users** simultaneously, the min. ballasting weight to be applied onto the damping mat (in case of a standard 3 x 3 m size mat) is: **200 kg/m² (1800 kg in total)**

Warning!

DiaSafe® - Line - System "Glide" may be used by one (“Solo”) or either two persons (“Duo”) at a time. Required ballasting surface weight applied on the damping mat may vary depending on the number of system users.

10 Completion of the installation

control label for Line System "Multi"

control label for Single System

control label for Line System "Glide"

After system installation, the self-adhesive validation label shall be filled out – as per the sample – and the label shall be attached to the side of the laminated cone on one of the posts.

validating sticker
Following a successful inspection, the validating sticker shall be attached by the inspector. The validating sticker shall be punched at the suitable date, and the sticker shall be attached onto the control label. The validating sticker shows the date of the next inspection.

Handover protocol

This handover protocol is part of the DiaSafe® System document folder and has to be handed over to the owner of the investment no later than the delivery of the building.

Certificate Number of installer: .....

Surface weight of ballast: ..... kg/m²

Data sheets of ballast materials have to be attahed to the handover protocol and a copy of it shall be sent to the manufacturer. (It is advisable to upload it during the online registration of the systems.)

This protocol confirms that the involved DiaSafe® Systems - according to the manufacturer's specifications, the building law this in Hungary and the current standards and guidelines, and suitable for normal use - have been registered at the manufacturer with the serial numbers listed below. In case of collective (several systems on the same roof or building site) online registration (www.diasafe.diadem.com) all the different serial numbers of the systems must be listed. Serial numbers generated by the manufacturer are indicated both on the control label and on the front side of the document folder.
A clearly visible photo must be taken of the punched and attached validation label. The photos and the handover protocol have to be uploaded on the website during the online registration of the systems.

.....
.....
.....
.....
.....
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.....

In case of proper use (see DiaSafe® Technical Manual) the listed systems can be used until ..... (date of registration + 1 year).

After the expiry date of the manufacturer's 12 month guarantee period the owner of the building shall ensure that the system is regularly inspected and that the manufacturer's permission – needed for the proper and safe usage – is prolonged .

....
Date Name (with capital letters), signature of installer

www.diadem.com Handover protocol_EN

handover protocol

System delivery and reception are accurately registered in a comprehensive protocol, based on the template in the document folder. This protocol is to be signed by the installer. It is advisable that all relevant parties are to receive a copy of the protocol.

System installation should be well-documented with photos, especially parts which will later be covered and will not be visible (e.g. soil).

online registration

After the completion of the installation the installer shall undertake the responsibility to register the system at the manufacturer (www.diasafe.com). The aim of the online registration system is the monitoring of the status of the installed systems and to help the owner/facility manager organize the regular technical inspections of those (due within 12 months after system delivery). Should this inspection fail to be accomplished, permission to use the system shall terminate, and guarantee is also considered void.

The online registration system sends messages to the installer and to the owner/facility manager in the following cases:

- after the registration of the installed fall protection system (regarding the 12 months operating license)
- 2 months before the termination of the operating license
- 1 month before the termination of the operating license
- at the time of the termination of the operating license
- after the technical inspection of the system (regarding the grant or refusal of the next operating license)

Professionals having the manufacturer's certificate are authorized to use the online registration system. The registration is based on the serial number that is indicated on the control label or the documentation folder. During registration it is required to give the serial numbers and the exact position of the installed systems, the date of the installation and the contact of the constitutor of the installer. It is recommended to give the contact of the owner/facility manager as well in order to supply them with the information about the expiration and result of the technical inspections. It is also suggested to upload plan- and photodocumentation relating to the registered system.

11 Swaging

11.1 Press Machine to be used for swaging

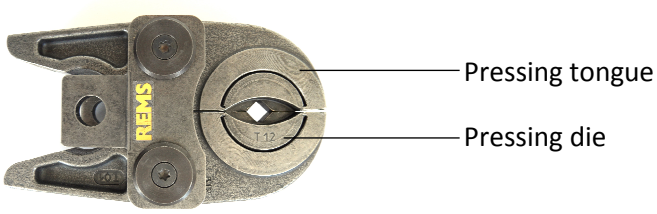
DiaSafe® anchoring systems have been tested and approved with swaging made with REMS radial press machines. The following models are considered to be appropriate for swaging:

Power-Press
Power-Press SE
Power-Press ACC
Akku-Press
Akku-Press ACC

These machines are set to press with a thrust of 36kN originating a pressing power of 100kN.
All radial press machines must be yearly revised by its manufacturer in order to guarantee the appropriate swaging. Make sure the press machine you are using has a certificate that proofs that the yearly check has been done within the last 12 months.
The use of any other press machine must be first approved by the manufacturer of the DiaSafe system.

11.2 Pressing tong and die to be used for swaging

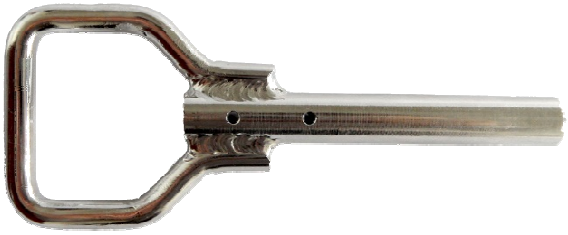
In all cases the swaging must be done with a T12 die, which will fit the normal pressing tong.



Pressing tongs must be replaced after 10 000 swagings.
Pressing dies must be replaced after 5 000 swagings.

11.3 Safety warnings for all swaging in the system

Make sure the wire rope is fully inserted into the swaging tube. The wire rope must be well visible at both perforations of the tube to be swaged.



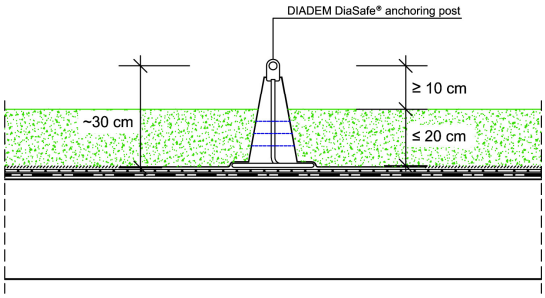
Make sure the preset swaging force is delivered by the swaging machine.
The swaging machine must click when the preset force is reached. If the machine does not click, the swaging is not complete and must be considered as inadequate and must be discarded.
If the battery is low in charge, the failure indication light turns on. All swaging made while the low battery charge light is on must be considered as inadequate and must be discarded.

11.4 Swaging process

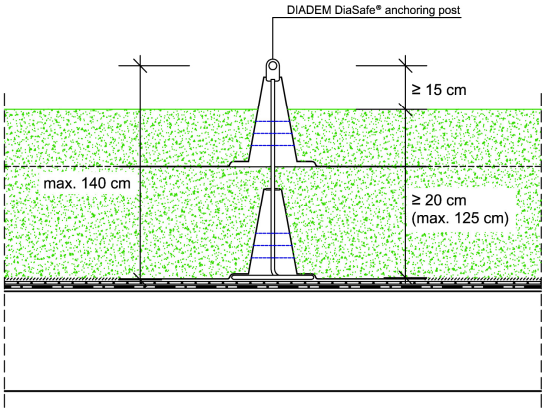
Once the wire rope is fully inserted into the swaging tube, the wire rope can be seen through the check perforations, or it is completely out at the other end, open the pressing tong and place it over the pressing tube as on the picture below:

Press the rivet of the pressing machine, until the click indicating that the maximal press force of the machine has been reached sounds. The swaging is finished:

12 Installation of the system at different heights of ballast material



Ballast material ≤ 20 cm



Ballast material ≥ 20 cm

The layer thickness of ballast material on green roofs may vary. If the thickness of the ballast doesn't exceed 20 cm, then the system can be installed in the standard way. In all cases it is important to leave at least 10 cm from the head of the anchoring post to the upper surface of the ballast. The lag of the Line System wire must always be less than 5 cm.

At bigger layer thicknesses the system has to be installed using a unique size anchoring post and a height extension damping plate. The height of the unique anchoring post is maximized to 140 cm. The post and the standard damping plate with the integrated damping mat is always placed at the bottom level of the ballast, while the height extension damping plate is placed on the plane level situated 30 cm below the head of the post. In this way the distance of its base to the head of the post is same as in case of the 30 cm standard post.
There is no damping mat integrated into the extension plate, as its only function is to hold the upper part of the anchoring post.
This applies to Line Systems and Single Systems alike.

13 DiaSafe® - System - Use

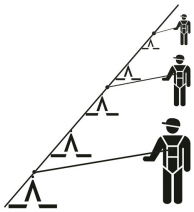
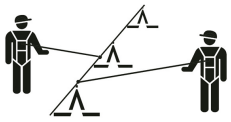
13.1 User manual

DiaSafe® Single Systems and Line System users are obliged to carefully read this manual prior to using the system, and shall closely follow all relevant safety regulations during use.

Should any question arise in terms of a fall protection system, its components, or its use, or an already purchased system is in a condition that its safe use is questionable, or for any general queries, please address the manufacturer directly.

13.2 Number of permitted users

DiaSafe® Single System "Solo" allows anchoring one user, while DiaSafe® Single System "Duo" allows anchoring two users simultaneously. The karabiner of the personal protective equipment has to be attached to the circular opening on top of the Single anchor post. In the case of the DiaSafe® Line System "Multi" one user can be anchored in every other section simultaneously (one section should be left free between two users). The karabiner has to be attached to the wire rope of the system. DiaSafe® Line System "Glide Solo" can be used by maximum one person at a time, while DiaSafe® Line System "Glide Duo" can be used by maximum two persons at a time and the users have to attach the karabiner to the glider that allows free movement along the whole line of the system.

Single "Solo"	**Single "Duo"**	**Line "Multi"**	**Line "Glide Solo"**	**Line "Glide Duo"**
				
one user	**two** users	**several** users	**one** user	**two** users

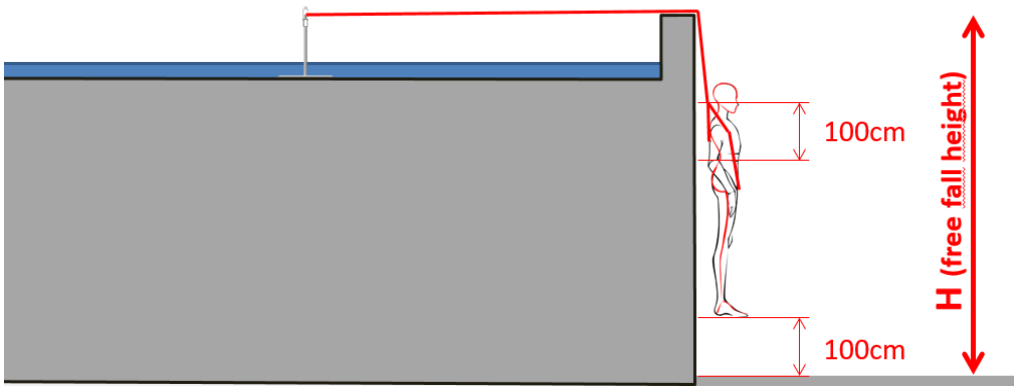
13.3 General terms of use

- DiaSafe® system structure, components and their roles were accurately described with figures and text in previous chapters of this manual. We shall herein highlight these sections again. If measures listed in Chapter 13 or individual inspections listed in Chapter 14 were not conducted, system use should be suspended or limited.
- If maintenance works were omitted or partially completed, and this jeopardizes system safety, it is prohibited to use the system. This rule applies when weather conditions hamper safe use of the fall protection system. You should always contact the manufacturer in such cases.
- Physical and health conditions of the user should allow them to properly utilize the fall-protection system, without risking his/her own personal safety.
- Fall protection systems can only be used by individuals who have received proper training and have learnt to use the system safely.
- Prior to working, all system users shall ensure that an evacuation plan, to be used in all emergency situations, is accessible.
- No modifications or additions can be made to the system without the prior approval of the manufacturer received in writing. Failure to receive such approval shall result in permission to use being rendered null and void. All restoration operations must be carried out in line with manufacturer's regulations.
- The personal protective equipment and the fall protection system can only be used in conditions listed in the manual. The systems can be used solely for their designated purposes.
- System users should make sure to receive – along with personal protective equipment – all instructions for safe system use. During the assembly of a fall-arrest or restraint system, the user should make sure that components fit each other properly and that all components are from the same manufacturer.
- Should components from a different manufacturer have been installed, this can prove to be dangerous for the user as such components can negatively influence safe system operation.
- The user should thoroughly check the operability of the personal protective equipment prior to use. >> see Section 14.2 of this Manual.

- The fall protection system must be installed on a solid and stable foundation, in line with the plan approved by the manufacturer. Checks to be completed before using the DiaSafe® system shall include measuring bulk density and surface weight of material spread to stabilise the system. When in doubt, always contact the manufacturer!
- If the user has any concerns or questions in relation to the applicable anchoring point, personal protective equipment or building structure, the user should immediately contact the manufacturer.
- A fall protection system can only be used with a complete body harness.
- Safety of system user requires that the building is high enough for reliable system operation, and users should make sure that, in case a fall occurs, they will not slam against any projecting parts or building sections, or the ground.
- DiaSafe® systems can be used as a restraint system for all building heights. Where the required building height is available, it can be used as a fall arrest system as well. We recommend the use of DiaSafe® fall protection systems combined with proper personal protective equipment.

Example of required free fall height calculation:
H = elongation of the anchoring system (deflection) + user shoulder height + length of stretched personal protective equipment (PPE) + 100 cm (safety distance)

Elongation of the anchoring system	**X cm**
Measure given by the body height	**150 cm**
Absorbtion strain (PPE)	**100 cm**
Safety distance	**100 cm** +
Min. building height	**H cm**



- Any disadvantageous conditions which negatively influence system operation must be avoided (extreme temperatures, sharp edges, chemical interaction, electricity, cuts, grinding, weather effect, potential swinging motion when falling, etc.)
- All instructions and drawings in the manual must be strictly adhered to!
- DiaSafe® system documentation contains all important data related to types, year of manufacture and system identification. You must check whether the content of the documentation folder matches those items listed in the table of contents.

14 General safety instructions

14.1 Danger zones on flat and low pitch roofs

The entire surface of walkable flat roofs and roofs which are used for special purposes are considered **potential threats.** Individuals within a **2.00 m wide area measured from the edge of the roof (fall point)** face the highest risk.
All roofs with an inclination lower than 5° are considered flat roofs.

The following locations are extremely dangerous, and as such, they require special safety measures:

- Generally speaking, roof edges, actually all locations from where individuals can fall
- Building sections, e. g. long sides, where swinging motion can develop after a fall
- Roof edges and corners beneath which there are projecting building sections (e.g. balcony, wall corner etc.) and therefore, minimum building height required for safe use of a fall arrest system is not guaranteed
- Roof sections where there is a danger of tripping (roof vents, lightning conductors, low surface lights, projecting structures etc.)
- Roof stairs without safety devices, poorly lit places and places without lighting
- In-built snow removal or other devices
- Non-shockproof roof components (e.g. lights)

14.2 Basic safety when working on flat roofs

Besides on-site safety measures, in order to provide safe working conditions on the roof, it is important that individuals present can use the Diadem® - DiaSafe® system, and that they are familiar with all their functions and elements.
It is vital for their own safety, in order to avoid risk of falling when working at heights.
It is therefore necessary to wear fall prevention personal protective equipment (body harness). The personal protective equipment and the fall protection anchoring system are combined into a single unit. It is of utmost importance that the individual working on the roof should receive proper training and should master all relevant knowledge.
Only then, will the worker be able to select, use and maintain the most appropriate personal protective equipment, and to check any disturbances, as well as to gauge embedded risks before use.

15 DiaSafe® - System - Maintenance

15.1 Introduction

A precondition to any work done at heights is a properly designed and tested fall protection system whose elements operate in a well-coordinated way in order to ensure maximum protection for individuals working on roofs.

All key manufacturer's data and regulations which are needed for safe operation can be found in the Diadem® - DiaSafe® system document folder.

Long-term and reliable operation of the fall protection system not only requires proper use, but also necessitates adherence to the following rules:

- **System component maintenance and storage**

Safe operation and damage-free condition of personal fall protection equipment and other protective equipment require regular cleaning and suitable storage of system elements.

- **Regular inspections**

The personal fall protection system and other protective systems should be regularly checked for damage, wear and tear.

- **Regular inspections by experts**

These are inspections carried out by experts who have received proper training from the manufacturer. These experts can spot potential system errors or weak points; they can help uncover the reasons behind failures and, if necessary, can rectify the error or take necessary measures for correction.

15.2 Field inspection before usage – by user

Naturally, safety of work made on roofs does not solely depend on the state of the fall protection anchoring system. Nevertheless, it is important to ensure that the entire work area, including driveways and paths leading to it, as well as the personal fall protection system are in safe condition >> see local work safety regulations.

The user should – at a minimum – inspect the following components on-site – as safe operation of these elements is of crucial importance. Obviously, there can be other things to be checked, as these items affect the safety of individuals working on roofs:

- Inspection of all paths and walkways leading to the work site (roof stairs, stairs, ropes, ladders, etc.). Is it safe to walk on/use them?; are the walkways clear of any disturbing objects?; can one trip and fall on/into something?
- Are necessary signs affixed at visible spots?; are the signs easy to read?
- Does the DiaSafe® system documentation contain all items listed in the table of contents?
- Is the roof properly lit?
- Bearing the actual weather conditions in mind (ice, snow, water, moss on constantly wet surfaces), can work be safely done within the effective range of the fall protection system? Independently from norms and local regulations, we do not recommend to do work or remain on any roof when temperatures are below 5°C or freezing is likely.
- A fall protection system used on a roof cannot be combined with different types of fall protection devices (Act on Work Safety).
- Have all the necessary maintenance and preservation operations been completed as per the control schedule?
- Is the relevant control label filled out, in harmony with actual conditions?
- Has any errors uncovered by the previous check been rectified as necessary?
- Are all components of the fall protection equipment intact and free of damage (especially the anchoring wire, the carabiner, the fall protection device, the energy absorber and screws)?
- The personal protective equipment must be thoroughly checked for errors and malfunction before each and every use.
- Is there a technical manual for the personal protective equipment published in the country's language? Has the user been informed on how to operate the system?
- Is there immediate rescue available after a fall?
- All components of the fall protection system and the personal protective equipment are from the same manufacturer and are not combined with products from other manufacturers?

- Are the fall protection system and the personal protective equipment compatible with each other? Has the DiaSafe® system manufacturer approved the use of the given personal protective equipment?
- Has the maximum length of the restraint system ropes been checked?
- Have the anchoring points been used, are they located in the system in line with the plan?
- Have all the maintenance and preservation operation been completed as per the schedule? please see the control label!
- Is the system's control label filled out as per the current status? Missing or damaged control labels and validating stickers should be replaced, and new ones should be ordered from the manufacturer. Remarks and data from previous tests should be checked.
- Can all anchoring points and related wire sections be used freely? (are the points in high-growing plants or flowers) Can the personal protective equipment carabiner move freely in all sections?
- Does the actual thickness of the ballasting layer for all fields around anchoring points correspond to the minimum thickness set forth by the manufacturer?

Ballasting layer thickness must be measured before each and every use and compared with figures indicated in tables in the documentation, in terms of specific weight of the material in question.

- Is the correctly-sized ballasting area (damping mat surface) guaranteed at every post?

length x width x layer thickness x bulk weight.

- Is the Line System wire properly tightened?; is it not damaged (some threads torn, broken, etc.)? Are fixing heads tightly fitted to the top of posts with setscrews?
- Are the fixing square rings properly built into DiaSafe® system posts?
- Are turn buckles and wire nut clamps properly tightened?

15.3 Regular inspection and maintenance of the system – by manufacturer

DiaSafe® fall protection systems, described herein, consist of fixed and mobile anchoring points which were constructed to be used with personal protective equipment manufactured as per standard EN363.

Standards EN795 and EN365 and work safety regulations require periodic inspections to be carried out on anchoring points every 12 months.

In order to obtain skills necessary for the completion of periodic inspections, the manufacturer offers technical training. Annual technical inspections can only be carried out by an expert or a professional service technician.

Important warnings:

- Regular technical inspections are indispensable as such tests can ensure the proper operation and durability of anchoring points, and guarantee safe and secure system operation.
- If regular technical inspections are not carried out at least every 12 months, permission to use expires and the system must not be used. If a country has other regulations in force, the system is used frequently, or the system is exposed to extreme environmental conditions, technical inspections can be carried out more frequently than 12 months.
- Service technicians executing such inspections shall always refer to the manufacturer’s instructions.
- Maintenance and care of personal protective equipment shall strictly follow manufacturer's instructions. Should the personal protective equipment become wet during use, it can only be dried naturally; it must not be exposed to a direct heat source.
- It must be ensured that the system is not exposed to harmful or extreme weather conditions (constantly wet environment, sharp edges, intensive vibrations, etc.) for a long period(s).

- As far as products falling into the scope of standard EN365 are concerned, these products, in some countries, may have to comply with additional requirements as set forth by 89/686/EEC or other EU directives.

15.4 Manufacturer directions for system inspection

Periodic technical inspections, carried out by the authorized service representative, shall be properly documented, and reports shall be kept until at least the following technical inspection.

It falls into the scope of the building owner or building operator to carry out annual checks of the fall protection anchoring system in due time. A completed test shall be marked on the control label as well.

A copy of the inspection report duly signed by the field service engineer shall be given to property owner/operator – together with photos or videos documenting system status before and after inspection. The video should introduce the DiaSafe® system in its entirety.

Periodical technical inspections should check the following items:

- **Checking wire condition and tension:**
  Maximum wire lag cannot exceed 5 centimeters; fixing heads should close tightly, setscrews should be properly tightened, the wire and its threads should be free of any damage – otherwise the affected wire section must be replaced in line with manufacturer's instructions.
- **Fixing heads / anchoring tabs on DiaSafe® post heads**
  Line System wire must be routed along the planned path, driven through fixing head slots and fixed tightly into the heads with setscrews. All components must be in working order, at their proposed position; there can be absolutely no corrosion on Single System anchoring lugs, nor on Line System components. Should corrosion be observed, the affected component must be replaced.
- **Closing and mounting wire terminations at corner and end posts**
  It needs to be checked whether wire mountings corners and end posts are in line with manufacturer's regulations (Installation Guide). Are anchoring rings free of corrosion? Do they hold the wire properly? Is a turn buckle installed at required locations? Does turn buckle work as needed or does it need to be adjusted?
- **Verifying ballasting layer thickness**
  Does the actual thickness of the ballasting layer reach the minimum values set forth by the manufacturer in each anchoring point damping area? Periodical technical inspections shall check ballasting layer thickness, and compare it with figures indicated in tables in the documentation, in terms of specific weight of the material in question. Product data sheet shall be kept in the documentation folder.
  Furthermore, it must be checked whether there is enough ballasting surface (area covered with damping mat) at every post to bear the prescribed load?
  length x width x layer thickness x bulk weight

- **Control label and inspection report (downloadable from www.diasafe.com before inspection)**

During post-installation technical inspection, one shall register the date, the serial number, the material and height of the ballast and the surface weight of it onto the control label, and the label shall be affixed to a visible location on the system.
Besides system data (type, model, manufacturer, serial number, installation date, installation location, owner's representative), the inspection report should incorporate all other relevant data, such as the basis for inspection report; what damage or issues were identified; all completed operations and tasks; name of the person carry out the inspection and due date of the following technical inspection.

- **Handing over technical inspection documentation to the relevant staff members**

Owner/operator of a building equipped with a DiaSafe® system shall receive a copy of the technical inspection report and related annexes. These documents are to be retained (see above).

Warning!

Should any concern arise concerning system safety or error free operation, IT IS PROHIBITED TO USE THE SYSTEM ANY LONGER. System use can only be resumed once errors have been rectified or an official inspection confirms that the system is free of any errors.

Any system malfunction or inadequacy must immediately be reported to the manufacturer, or the authorised company, in writing.
After a fall, the DiaSafe® fall protection system and related personal protective equipment cannot be used unless the manufacturer or a person authorised by the manufacturer examines the system, and issues a permission in writing.
In such a case, used system components are likely to be replaced.

15.5 Lifetime of the systems

The maximum lifetime of the DiaSafe systems – in case of adequate and professional use, without visible deterioration and under optimal conditions – is 20 years from the date of the professional installation.
The lifetime significantly depends on the way of use and the regular inspections. Periodic inspections are to be accomplished in every 12 months at least.
If a DiaSafe® system has been used to arrest a fall, it is prohibited to use the system again.
Under extreme (like weather) conditions, the system may be damaged in the period between the regular inspections. If such a case occurs the use of the DiaSafe system is prohibited. For this reason the inspection of the system is necessary before and after every use.

16 Certification

16.1 Manufacturer research, investigation and testing

Before the Diadem® - DiaSafe® system was commercialised, we had conducted several tests with our test equipment which is set up in accordance with the relevant EN795 and CEN/TS 16415:2013 standards. These tests confirmed that the system operates flawlessly and safely, providing the installation has been accomplished in line with the relevant instructions.
These tests have been documented with reports, photos and videos. Relevant expert summaries have also been attached.
DiaSafe® system was tested and certified by TÜV-Austria.

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Notified Body 0408

17 Important notes and safety warnings

17.1 Modifications and changes

In order to ensure continuous product development, technical characteristics of DiaSafe® components are subject to change by the manufacturer. If such changes affect system safety, the registered inspecting institution which completed system checks and issued the type certificate shall examine the modified product as well.

17.2 Instructions for the safe use of DiaSafe® systems

The Manual must be read thoroughly

Can only be used with personal protective equipment and built-in fall decelerating device

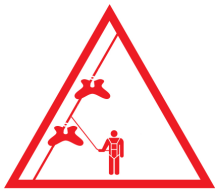
Anchoring max. 1 user simultaneously **(Single System ”Solo”)**

Anchoring max. 2 users simultaneously **(Single System ”Duo”)**

For simultaneous fixing of several users

Maximum 1 user in every other span/section **(Line System ”Multi”)**

At least one section should be kept clear between two users



Anchoring max. 1 user simultaneously **(Line System ”Glide Solo”)**

Anchoring max. 2 users simultaneously **(Line System ”Glide Duo”)**

The 2 users can be attached in the same span/section

18 Conclusion and notes

DiaSafe® Line and **DiaSafe® Single System** are anchoring installations tested and approved by the standard EN795:2012. These systems are adequate for attaching approved personal protective equipment compliant with EN363 and EN365 and use as safety device against fall from heights.

Warning!

If a DiaSafe® system has been used to arrest a fall, it is prohibited to use the system again. In such a case, relevant system components must be overhauled!

The original documentation was prepared in English. In the event of any discrepancies between the other language versions the English language description should be regarded as authoritative. We assume no responsibility for any discrepancies resulting from the translation.

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